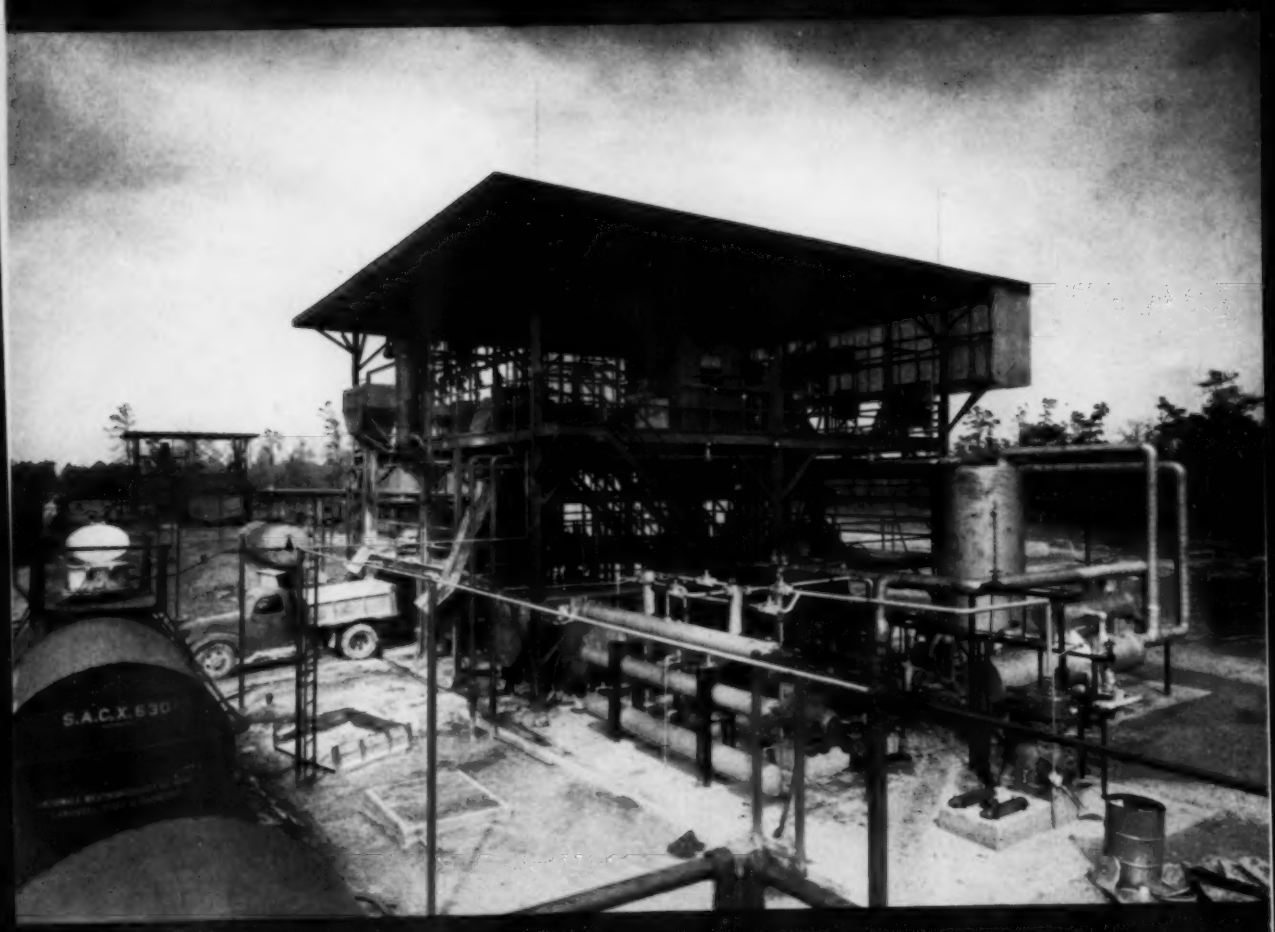
Vol. VI, No. 4

AGRICULTURAL CHEMICALS



Nat'l Agricultural Chemicals Ass'n Meeting • Fertilizer & Insecticide Allowance • Soil Fertility Research • The Sulfur Situation • Washington Conference Report • Pest Control Problems for Cotton • Fertilizer Application Study • 'Seed' Storage • Phytotoxicity • New Pesticide Plants

IMPORTANT NOTICE

On and after April 15th our General Sales Office will be located at the following new address

1625 EYE Street, N. W.
Washington, 6, D. C.
Telephone: STERLING 4990

Our New York office will be discontinued as of the above date.

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Reasons why? Attaclay does a fine, low-cost job. Products containing 15% and 25% parathion possess a high degree of fluidity. Processors know that Attaclay will save time and money in production steps, and deliver dry, free-flowing parathion bases that are considered "premium" by blenders.

Count *twice* on Attaclay in parathion service: (1) to help produce high-quality pesticides and miticides for increasing both yield and quality of many fruits, vegetables, grains, and tobaccos; (2) to save a lot of cold cash in the doing.

We invite you to discuss the matter with us.

DUSTS VS. SPRAYS
From the air, or on the ground, you get from 2 to 7 times more payload when you apply dusts.

ATTAPULGUS CLAY COMPANY
Dept. P, 210 West Washington Square, Phila. 5, Pa.

...WITH SAFETY WHEN NEEDED!

THE PERFECT INSECTICIDE is one which is highly effective against insects, yet entirely harmless to humans.

In time, perhaps *all* commercially successful insecticides will be *completely safe* insecticides. Certainly that is an ideal which will meet hearty approval by everyone.

Meanwhile, there are insecticide materials such as POWCO BRAND CUBE, fulfilling the ideals of effectiveness with safety, available NOW to meet *today's* needs.

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KILLING POWER—THAT'S THE THING!

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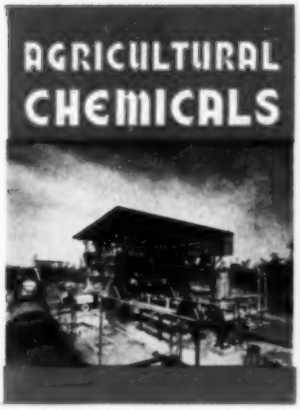

THIS MONTH'S COVER

With the current shortages of both DDT and BHC, this new plant of Kolker Chemical Works, Inc., at Houston, Texas is of unusual significance. Unit in the foreground produces technical 35% gamma BHC and the unit in the background was expected to be producing technical DDT early in April. Ground was broken only last June 22 for the 48-acre project, and production of BHC began Oct. 24. These are the first of several organic agricultural chemicals planned to be produced by Kolker at Houston.

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APRIL 1951

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A Monthly Magazine For the Trade

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to the one hundred
fifty-three Colorado .44 Brand
products of the
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of Colorado

153 items you can for your 1951

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AVAILABLE IN DUSTS AND LIQUID FORMULATIONS

- 44 Aldrin
- 44 Dieldrin
- 44 Toxaphene
- 44 Benzene Hexachloride
- 44 Chlordane

Formulated in any combinations to suit the recommendations of yourself, your customers and your county agent.

CATTLE SPRAYS

- 44 Gold Star Livestock and Barn Concentrate
- 44 Stock and Barn Insect Killer
- 44 Dairy Spray
- 44 Grub Dust
- 44 Ben-Hex 10
- 44 Sheep Dust

BRUSH KILLERS

- 44 Brush Murder (2,4-D and 2,4,5-T)
- 44 Hi-Strength Brush Murder
- 44 2,4,5-T Concentrate

TOXAPHENE

- 44 Emulsifiable Toxaphene Concentrate
- 44 Super Toxaphene Concentrate
- 44 Toxaphene Oil Concentrate
- 44 Cotton Dust 20-40
- 44 10% Toxaphene Dust
- 44 20% Toxaphene Dust
- 44 Wettable Toxaphene Powder

WHEAT CHEMICALS

- 44 2,4-D Weed Killers
- Toxaphene Emulsifiable Concentrates and Dusts
- 44 Chlordane Emulsifiable Concentrates and Dusts
- 44 Parathion Emulsifiable Concentrates and Dusts
- 44 Tepptone Emulsifiable Concentrates and Dusts

CORN INSECTICIDES

- 44 25% DDT Emulsion Concentrate
- 44 DDT Wettable Powder
- 44 Parathion Emulsifiable Concentrate
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select from stock... buy now!

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- 44 Wettable Dust Concentrate

DDT PRODUCTS

- 44 25% DDT Emulsion Concentrate
- 44 DDT Wettable Powder
- 44 DDT Dust Concentrate
- 44 DDT Cotton Dust 3-3-40
- 44 5% DDT Dust
- 44 Potato Dust 5-90
- 44 Potato Dust 10-80

COLORADO 44 BRAND

GARDEN INSECTICIDES

- 44 Octakill
- 44 Emulsifiable Concentrate
- 44 Chlordane Dust

2,4-D PRODUCTS

- 44 2,4-D Weed Killer Liquid Amine Concentrate
- 44 Butyl Ester 2,4-D
- 44 Isopropyl Ester 2,4-D
- 44 Aero Butyl Ester
- 44 Super "80" Butyl Ester

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FOR MORE INFORMATION ABOUT COLORADO .44 PRODUCTS, TURN THE PAGE

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.44 PARATHION

kills the green bug... makes your profits and the farmer's income greater

Recommend Colorado .44 Parathion—the versatile insect killer. Kills corn borer, aphids, grasshopper, armyworm, and the greenbug in wheat and all small grains. Phone, wire or write today to learn about Colorado .44 Parathion.

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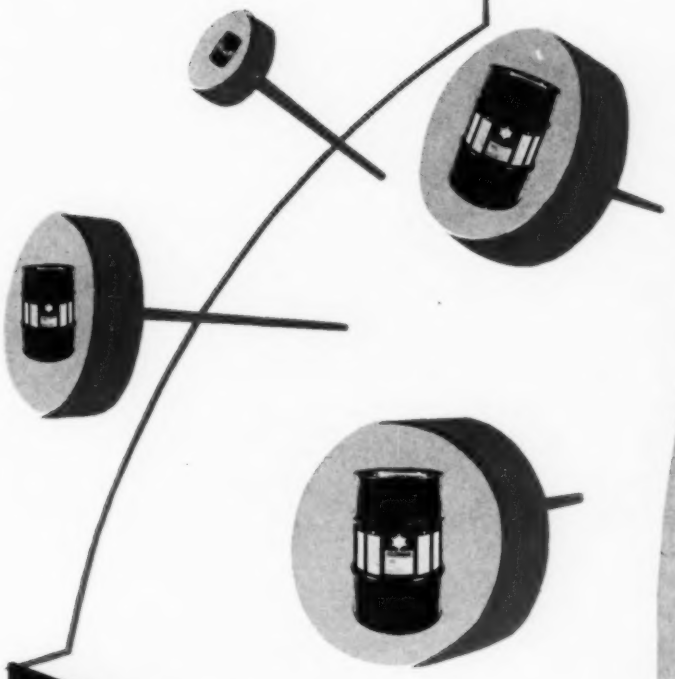
play this Colorado .44

CHLORDANE

profit tune on your cash register



From coast to coast, dealers sing the praises of this new, more effective insecticide. It's powerful and deadly—especially to grasshoppers, lygus bugs, alfalfa weevils, roaches, ants, mosquitos, Japanese beetles, grubs, wire worms and many other agricultural and household pests! Phone, wire or write today for information.

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You can start harvesting now!

Colorado .44 Weed Killers are available in many formulations, in a complete range of sizes. Phone, wire or write today for full information.

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- Colorado .44 Butyl Ester of 2,4-D
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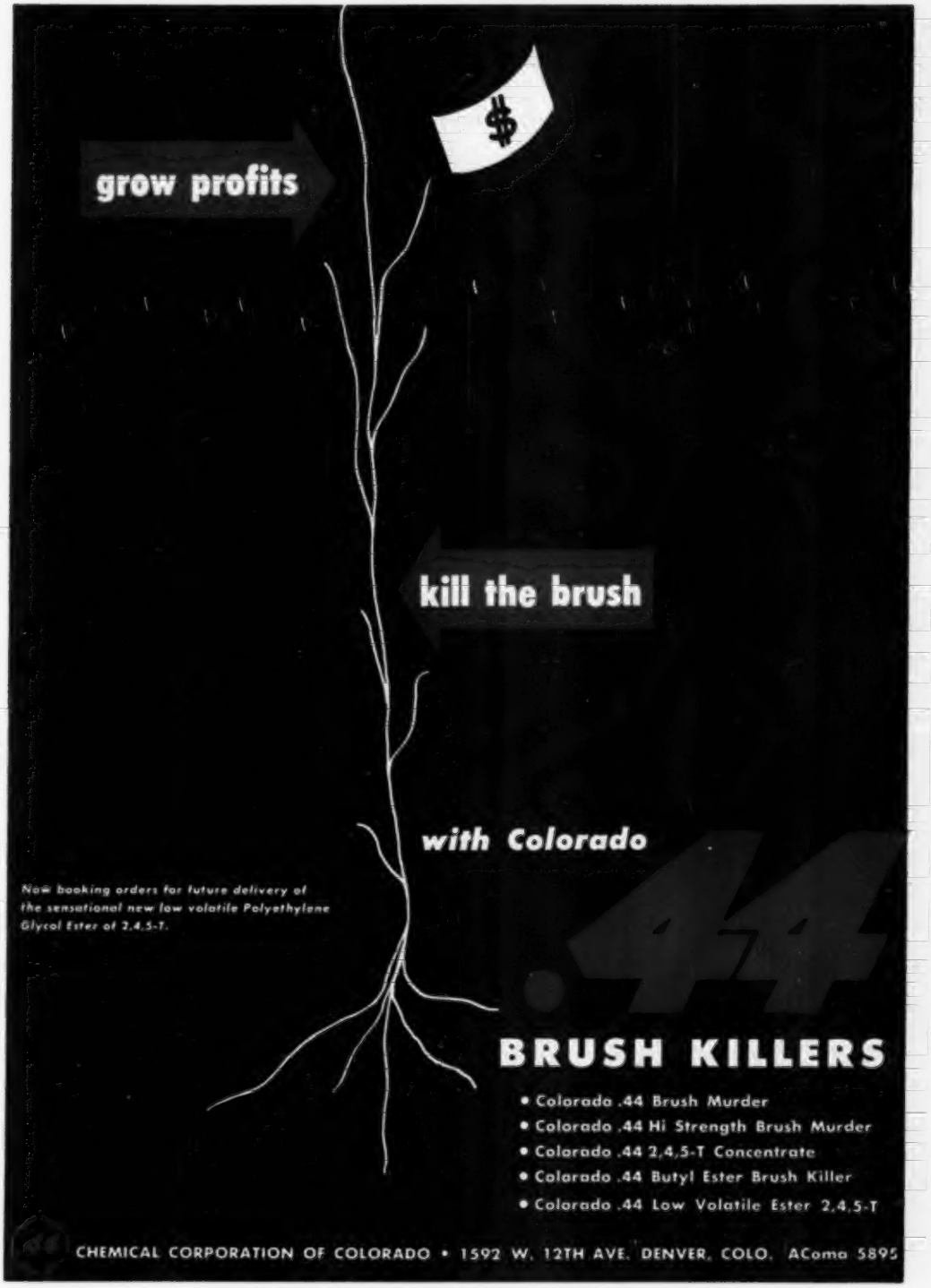
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KILLS COTTON INSECTS

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Colorado .44 Toxaphene. Finest formulations in the country! Gives maximum control over hard-to-kill insects.

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Colorado .44 2,4-D, 2,4,5-T Weed Killers. Available in Amine, Butyl Ester, Isopropyl Ester forms.

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Name .....

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Chemical Fertilizers

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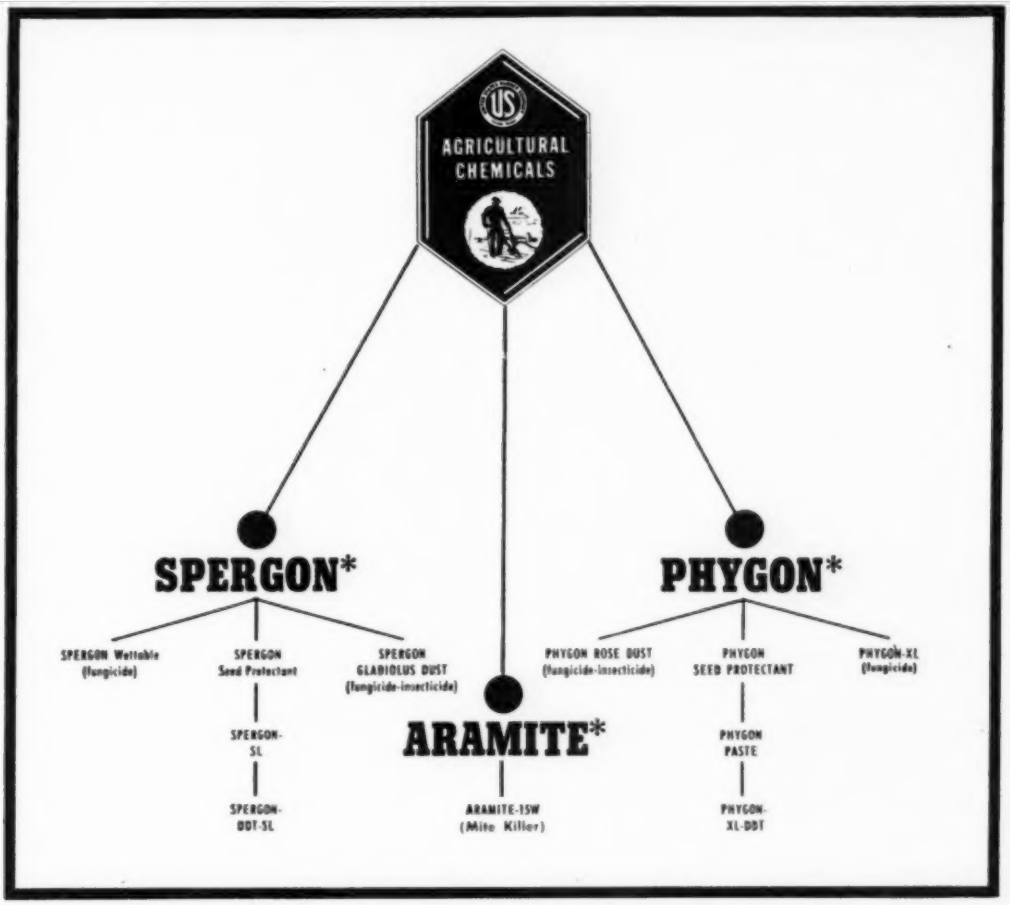

The Naugatuck Family Tree Bears Fruit For All

With due modesty, but not without pride, do we of Naugatuck speak of the many benefits made possible by our agricultural chemical products.

To farmers, growers and canners, they have helped to bring better crops, finer produce. To our suppliers and distributors... to the seed processors and all others our products serve, they have contributed a new source of business and profit.

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UNITED STATES RUBBER COMPANY

NAUGATUCK CHEMICAL DIVISION **NAUGATUCK, CONN.**

Also manufacturers of *insecticides*—Synklor-48-E, Synklor-50-W—*weed killers*—Tufor-40.

convert
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prospects
to customers
with this

ISOPROPYL AMINE dry
salt formulation

EASY TO MAKE — A tested formulation contains 73 per cent by weight 2,4-D, 23.4 per cent Isopropyl Amine, and 3.6 per cent citric acid. It is prepared by adding the anhydrous amine to a benzene slurry of the acids followed by filtration and drying. (If preferred, aqueous *concentrates* containing 4 pounds of 2,4-D per gallon can be made using Isopropyl Amine.)

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destructive soil insects

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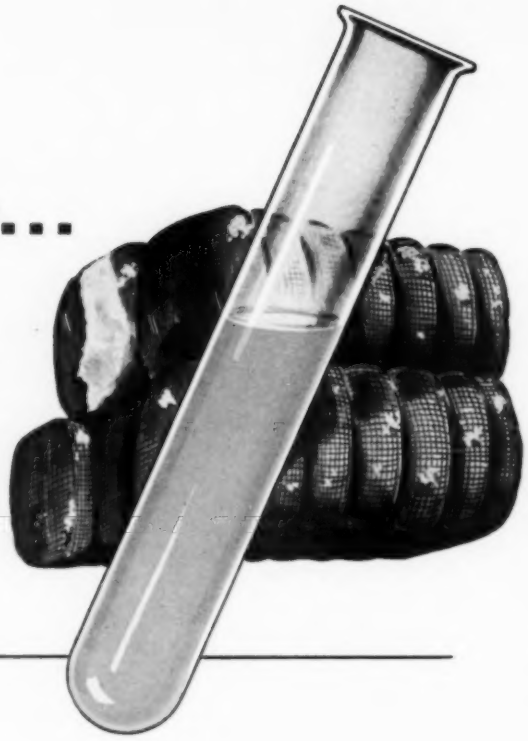
in agricultural chemicals since 1910



Once again, American agriculture is called upon to expand production of food and fiber. Simultaneously, the tempo of the war against crop insect pests must be stepped up.

Ashcraft-Wilkinson's reputation as a reliable source of agricultural chemicals has been well known to the trade for over forty years. Now, as in 1910, the products we distribute must be of highest quality—certified in our own laboratory for purity, content and strength.

We place high value on the Ashcraft-Wilkinson reputation for reliable service on agricultural chemicals, and we pledge our continuing efforts to fulfill the requirements of insecticide formulators. Four strategically located branches.

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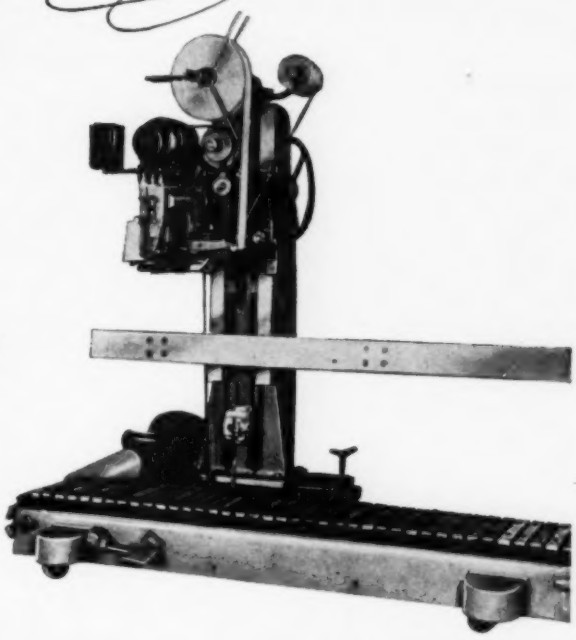

Model ET applies famous "Cushion-Stitch" over dry tape for sift-proof closure. Model E-1 applies "Cushion-Stitch" only, for use where sift-proofing is not essential.

When you buy a Bagpaker®, you get a "guardian angel" as well.

He may not look as angelic as the cherubs on a Christmas Card, but his intentions are just as golden. He's the Bagpak Service Engineer, and his job is to keep your Bagpaker in good shape—happy and well-adjusted so that it can provide the kind of continuous, trouble-free performance it was built to give.

That isn't very hard for a Bagpaker to do, because Bagpak designers have put in *extra strength*—heavy duty working parts—welded steel construction—all improvements that reduce lost time due to breakdowns. The savings on this alone can be tremendous over the years.

The combination of superior design and construction, plus experienced Bagpak service, makes the Bagpaker the kind of machine that brings your bag closing operation "a little closer to heaven."

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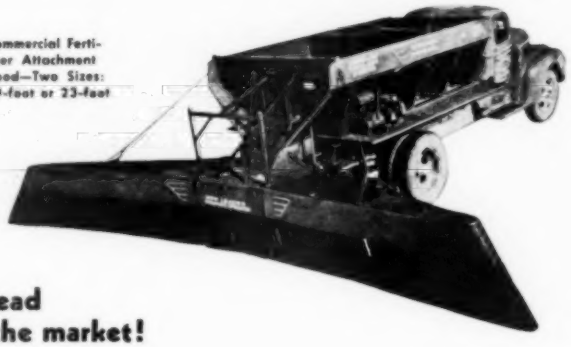
AGAIN! "The NEW LEADER" leads the field



Commercial Fertilizer Attachment Hood—Two Sizes: 19-foot or 23-foot

with its new "Motor-Driven Spreader" offering greater accuracy of spread with the most positive feed on the market!

SPECIAL ADVANTAGES — Uniformity of spread is not dependent on truck speed. Motor is mounted on catwalk and drives only the twin distributor discs at a constant speed, assuring full width of spread at all times together with uniform distribution.

Conveyor is separately driven from truck drive shaft by a series of V-belts to deliver the correct amount per acre—regardless of truck speed or regardless of whether the truck is driven in low, super-low or any other gear.

Conveyor speed is, therefore, positively synchronized with speed of the rear wheels of the truck and at each revolution of the rear wheels, the conveyor moves a given distance regardless of the truck's speed. Amount of material delivered by conveyor does not vary with hilly or soft field conditions.

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Note: When Spreading Attachment is folded up for road-traveling position, width is approximately 7′-5″.

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FREE! Write for "The Story of a Custom Fertilizer Spreading Service"

HIGHWAY EQUIPMENT COMPANY, INC. CEDAR RAPIDS, IOWA

MANUFACTURERS OF THE WORLD'S MOST COMPLETE LINE OF SPREADERS

GET READY TO SHUT 'EM OUT

with

GEIGY'S

SPRAYS

GY-PHENE 40-20 COTTON SPRAY—(emulsifiable solution—4 lbs. toxaphene—2 lbs. DDT per gal.)

GY-PHENE E40 and E60—(emulsifiable solutions—4 lbs. and 6 lbs. toxaphene per gal.)

GEIGY ALDRIN "25E"—(25% aldrin emulsifiable solution- 2 lbs. aldrin per gal.)

GEIGY "10-20" COTTON SPRAY—(emulsifiable solution—1 lb. aldrin, 2 lbs. DDT per gal.)

GEIGY E25—(25% DDT emulsifiable solution—2 lbs. DDT per gal.)

DUSTS

GEIGY 3-5 COTTON DUST—(3% BHC—5% DDT)

GEIGY 3-5-40 COTTON DUST—(3% BHC—5% DDT —40% sulphur)

GY-PHENE "20"—(20% toxaphene dust)

GY-PHENE "20S"—(20% toxaphene dust with sulphur)

GEIGY 2½% ALDRIN DUST

GEIGY 2½% ALDRIN—5% DDT DUST

GEIGY 2½% ALDRIN—5% DDT—40% SULPHUR DUST

Also available: alternate products, including chlordane formulations and calcium arsenate, should national supplies of the above materials become depleted.

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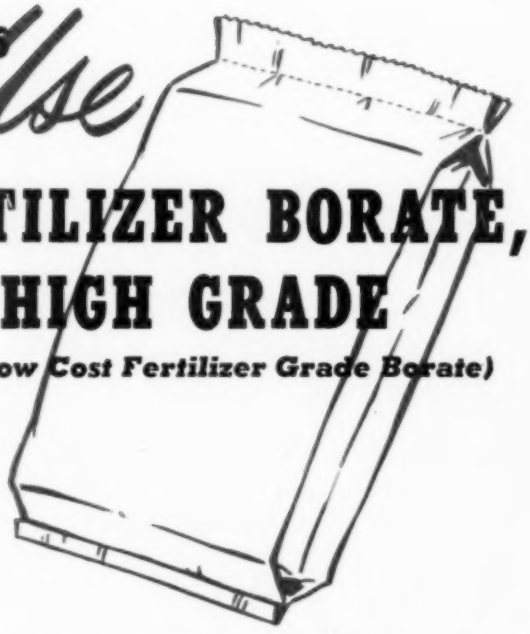

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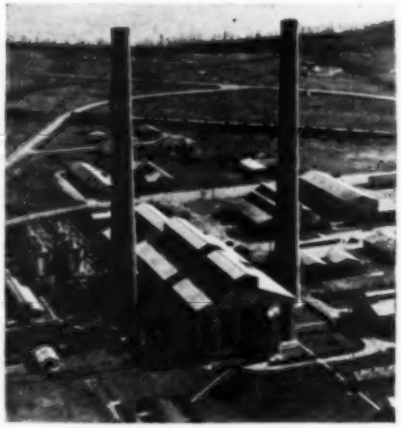

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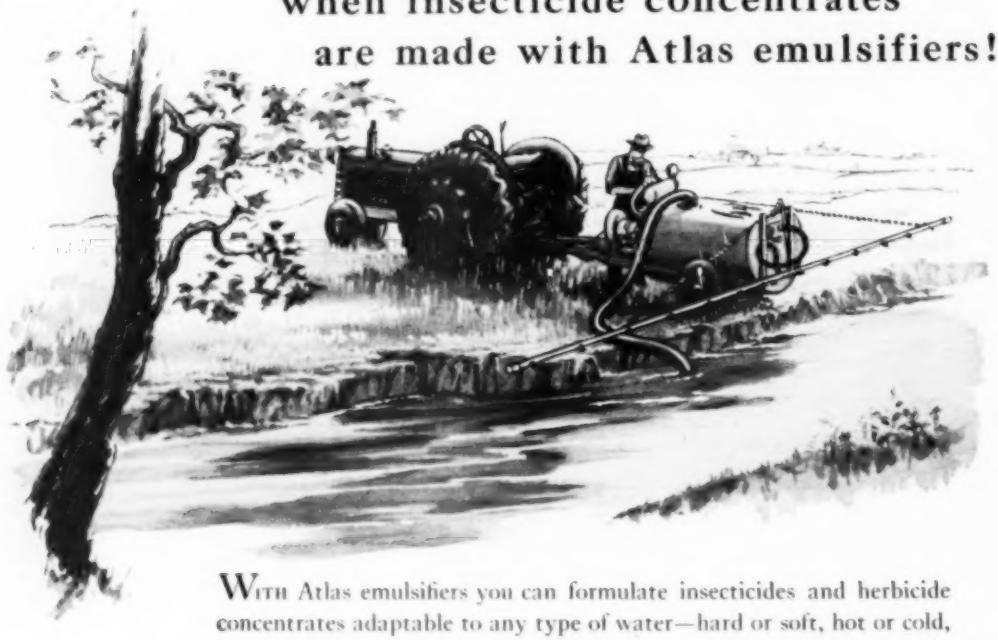

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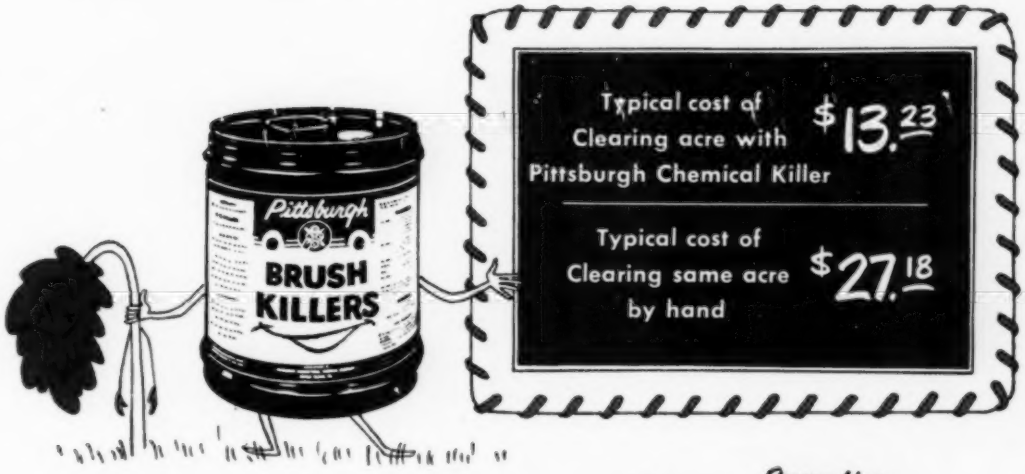

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Guest Editorial Written Especially for This Issue of Agricultural Chemicals

Careful use of pesticides urged to offset shortages

by

Roy E. Campbell

Alhambra, Calif.,
President, American Association of Economic Entomologists

FOR the coming season, acreage restrictions are off, and farmers are being urged to increase production. While special emphasis is given to certain crops such as cotton, increased production is needed for almost all crops in order to avoid shortages of any food or fiber needed in the present emergency.

Increased production can be obtained in only two ways—by increasing acreage or by increasing production per acre. For the nation as a whole, the amount of new acreage which can be put into crop production is limited. Therefore, emphasis must be put on increased production per acre. One of the best ways to increase production is to prevent crop loss by the proper use of pesticides. There are few crops which are not attacked either by insects or plant diseases, or both, which may seriously reduce growth and yield. Losses from these pests are tremendous, averaging over 4 billion dollars every year. It is obvious, therefore, that adequate means of control must be maintained to cut down such losses.

This is where the entomologist, plant pathologists, extension agents, and pesticide men come into the picture. By carefully watching the development of crops in the various areas, growers can be warned of approaching infestations and advised as to proper materials to use, the amounts to apply and the best time for application of these pesticides.

Shortages of some pesticides are expected to occur this year, especially of some of the newer ones. The available supply must be stretched as far as possible, especially by avoiding unnecessary applications, too heavy dosages, or formulations of unnecessarily high strength. Also, we must be prepared to use substitutes when and where these shortages occur. If dealers are unable to get an adequate supply of these new materials, they should stock up on the available substitutes.

With the prospect of receiving high prices for their crops, farmers will be especially interested in preventing any damage by crop pests. In order to prevent such damage, growers sometimes resort to untimely, excessive, or unnecessary application of pesticides. Such practices are not only wasteful of materials

(*Turn to Page* 118)

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THE EDITOR COMMENTS

THE point made in a guest editorial by Roy E. Campbell, president of the American Association of Economic Entomologists, appearing in this issue, should be amplified and heralded throughout the industry. In talking about the impending shortages of pesticides, the AAEE president says that advice to growers on the proper materials to use and details of effective application are the responsibility not only of federal, state and county agricultural officials. The greatest responsibility, he points out, lies on the local pesticide men who make actual sales to the farmers. These industry representatives have the job of seeing that the grower gets enough of the material needed for protection of his particular crop, but at the same time, to see that the grower is not oversold.

In times of shortages, the tendency is for consumers to go overboard in laying in a season's supply of pesticides so they'll be sure to have enough. If this hoarding instinct is to be curbed, it must be done by the local seller who should be able to judge whether a customer's order is excessive. If it is too much, the dealer should say so and maintain the reputation in his community of dealing fairly and trying to distribute a limited amount of goods equitably.

SHORTAGES of various materials are forcing the industry to scurry around for substitutes, to find better ways of manufacturing and other shortcuts to maintain production. Let the industry be advised, however, that attempts to re-use containers which have once held 2,4-D or 2,4,5-T, are very apt to backfire. Granted, containers are scarce. Granted also, it seems wasteful to ship insecticides and fungicides in new drums when the others, apparently good as new, would serve the purpose. However, it must be remembered that residues of herbicides such as 2,4-D are extremely potent and even after careful cleaning, containers once carrying these materials are not safe for other use!

A recent press release from the National Agricultural Chemicals Association warns that contaminated drums should not be used *under any conditions* for any other agricultural chemical. Residual 2,4-D can be broken down only by boiling with caustic soda and the containers would then have to be rinsed and cleaned thoroughly to remove all traces of water soluble 2,4-D sodium salt. "There is no chemical which will break down 2,4-D or 2,4-5-T into chemical products which would not harm crops," the NAC release reminds.

These facts are probably well known to most of the trade, but the potential consequences of such errors are so far-reaching that the point seems well worth repeating, even if it should be "old stuff" to many.

WITH a greatly increased demand for food and fiber in prospect for 1951-52 and the knowledge that only about 2% more land will be devoted to crop raising this year, it is evident that the only way possible to get more production is to increase the yield *per acre*, through larger use of fertilizers and pesticides!

Yet, the fertilizer industry and the pesticide manufacturers are short of many basic materials such as sulfur, which is still being sent abroad by the shipload. American industry is thus forced to limit its production because of the shortage.

Both the fertilizer and pesticide industries are anxious to do their part. The recent great expansion of manufacturing facilities proves that. Perhaps the attitude of the industry was best summarized recently in testimony before the House Agricultural Subcommittee on Fertilizer and Farm Machinery, by Paul T. Truitt, president of the American Plant Food Council: "The fertilizer industry, according to tradition, is able and ready to produce the total fertilizer need for American farmers." Give us the material, and we'll do the job!

Soil Insect Control in Southeast by Mixtures of

Pesticides & Fertilizers

THE advent of chlorinated hydrocarbons as insecticides has revolutionized the control of soil-inhabiting insects. Prior to the end of World War II when the insecticide potential of this group of chemicals began to unfold, chemical control of insects in the soil was difficult and extremely limited. Japanese beetle larvae had been controlled in small areas with soil applications of lead arsenate at from 400 to 1500 pounds per acre. Aside from the rather excessive cost, this amount of arsenic proved toxic to many crops on certain soil types. Certain highly volatile fumigants such as carbon bisulphide and paradichlorobenzene and others had proved costly and only partially effective. The chlorinated hydrocarbons gave the first real promise of an effective chemical control of soil-inhabiting insects at a reasonable cost. As compared to inorganic insecticides, they destroy insects at exceptionally low dosages. They kill not only by contact, but by fumigation and ingestion, or by the combined action of all three. However, as insecticides, these chemicals have certain limitations. Some are phytotoxic and others impart an objectionable flavor to certain foods. They remain stable in some soils for quite long periods and the full significance of this fact is not well known.

Most of the currently available chlorinated hydrocarbons such as DDT, BHC, lindane, toxaphene, chlordane, heptachlor, aldrin, dieldrin, and certain of the phosphate compounds such as parathion have been and are being tested more or less extensively as a control for soil insects at many points in the U. S. Keenest interest in the use of fertilizers as a vehicle for their application has naturally been centered in the southeast. The annual application of fertilizers to many crops in this area makes the fertilizer medium a logical and economical means of adding insecticides to the soil. The addition of such materials to fertilizers, however, raises several problems in manufacture.

Tests Began in 1945

IN 1945 Young and Gill (23) used DDT at 1.5 and 3 pounds per acre in a mixture with fertilizer for control of white fringed beetle. The mixture was applied in the drill rows just before planting. At either dosage only one-fifth as many corn plants were killed by the larvae as in the adjoining untreated plots, and the treated plots produced 40 per cent more corn. The toxic effect of DDT was found to persist to some extent for more than one season. Plots treated with DDT in 1945 had fewer larvae the following January than adjoining untreated areas. In 1946, without further treatment, only half as many cotton plants were killed by white fringed beetle larvae on treated as on the untreated plots. The drill row applications of DDT in 1945 had no measureable effect on the larval population counts in January 1947. However, some residual influence was apparent in the response of corn intercropped with velvetbeans in 1947. Larval damage to corn was light in all plots but three times as many velvetbean plants were destroyed by beetle larvae in the untreated plots as in the fertilizer-DDT treated plots.

by
J. G. Watts
Entomologist, Edisto Experiment Station
Blackville, S. C.

In 1945 a DDT-fertilizer mixture was used with good results for mole cricket control in seed beds in Florida (14). No consistent differences were apparent whether the powdered DDT and fertilizer were pre-mixed or applied separately. Although deterioration of insecticides stored as a mixture with fertilizer has not been studied extensively, no adverse effects have been reported. A commercial company ran tests for 192 days and longer and their results show little loss in measurable amount of chlordane during that period. After 30 days storage a DDT-fertilizer mixture caused only minor differences in germination of tomatoes in a greenhouse test (14). Fertilizer with DDT at 30 pounds per acre was considered safe for at least a month after mixing on cabbage, tomato, lettuce, collard, eggplant, and pepper seedbeds in Florida. In addition to controlling mole crickets this treatment also controlled the granulated cutworm, *(Feltia subterranea)* and certain species of ants. In later work (15) (16) chlordane at from 1 to 5 pounds per acre was found to be more effective than DDT for mole cricket control. The fertilizer medium was only one of several alternative methods of application. Ants, earwigs, cutworms, and certain grubs were also reported to be controlled in seedbeds with this mixture.

Further studies in Florida (22) showed 82 per cent wireworm control on potatoes with 4.3 pounds of chlordane in 1500 pounds of fertilizer per acre. Likewise 2.2. pounds of aldrin in 1500 pounds of fertilizer gave 88 per cent control. Also one pound each of DDT and chlordane in 200 pounds of fertilizer gave commercial control of mole crickets, chinch bugs, earwigs, cutworms, and reduced ant populations.

In Louisiana (9) one pound of gamma BHC or 2.5 pounds of chlordane mixed with 300 pounds of 6-8-8 fertilizer per acre gave complete control of the sand wireworm *(Horistonotus uhleri)*. In the check plots 50 per cent of the plants were destroyed and the vitality of the plants remaining was of a low order. The yield in the treated plots was increased 400 to 500 per cent over the untreated check.

Also in Louisiana (10) one pound of gamma BHC or five pounds of chlordane pre-mixed in 300 pounds of 4-12-4 fertilizer gave good control of the southern corn root worm *(Diabrotica duodecimpunctata)*. However, 25 pounds of DDT in a similar mixture had little effect upon this insect. Gamma BHC and chlordane in fertilizer also gave considerable protection against the seed corn maggot *(Hylemyia cilicrura)*, while DDT had less effect.

In 1948, good control of the sand wireworm on corn was obtained in South Carolina (20) (21) with from 0.5 to 4.0 pounds of chlordane per acre pre-mixed with fertilizer. BHC also gave good control at from 0.15 to 1.0 pounds per acre but its performance was somewhat less consistent than that of chlordane. Many farmers observed the experiments and demonstrations in progress and were so impressed with the results that they insisted upon the fertilizer manufacturers making available a chlordane fertilizer mixture for commercial use in 1949. Although the Experiment Station had made no recommendation, which would have been premature at that time, farmers ordered a "customer's mix" of chlordane in fertilizer and treated an estimated 50 per cent of the corn planted on soils having a wireworm history. In 1950, an estimated 90

Storage of fertilizer-insecticide combination apparently no problem . . . many soil insects controlled through this method according to tests in southeastern states...aldrin, dieldrin, chlordane, DDT, BHC used. Problems include those of blending, timing, phytotoxic effect of some materials & lack of state laws to cover such fertilizer-insecticide combinations

* Technical Contribution No. 179, South Carolina Agricultural Experiment Station.

per cent of the corn planted on soils with a wireworm history were treated with one pound of chlordane per acre pre-mixed with the fertilizer. Recent tests in South Carolina (7) using one pound of chlordane per acre in the fertilizer resulted in from 30 to 90 per cent increase in corn stand due to the control of the southern corn rootworm. On the other hand, insecticides up to 8 pounds per acre in fertilizer failed to control the tobacco wireworm, *(Conoderus vespertinus)* (1). Some data (unpublished) have been obtained in South Carolina on the use of insecticide-fertilizer mixtures for the control of root lice on cotton and on the control of soil insect damage to sweet potatoes.

In Virginia (6) insecticide-fertilizer mixtures proved effective in controlling the green June beetle larvae *(Cotinis nitida)* in tobacco plant beds. At slightly less than two pounds per acre, parathion, aldrin and dieldrin gave 92, 71 and 68% control, respectively.

Extensive tests are in progress in North Carolina on the control of the corn wireworm *(Melanotus communis)* with organic insecticides. In these studies promising results have been obtained with heptachlor, aldrin and chlordane mixed with fertilizer (17).

Studies dealing with insecticide-fertilizer mixtures are underway at the Alabama, Georgia and Tennessee experiment stations. These include, among others, soil insects attacking peanuts and sweet potatoes. The Bureau of Entomology and Plant Quarantine is investigating insecticide-fertilizer combinations for southern corn rootworm control on peanuts in Virginia, tobacco wireworm control in South Carolina and are continuing their work with the white fringed beetle in Alabama.

The addition of insecticides to fertilizers offered for sale is governed by the boards of fertilizer control in the various states. The Florida commercial fertilizer law (19) provides for the addition of chlordane, DDT, lindane, and BHC to commercial fertilizers. The South Carolina fertilizer regulations (2) contain provisions for the addition of organic insecticides to commercial fertilizers. The State of Georgia authorizes the addition of 0.5 and 1.0 pound of DDT per 100 pounds of standard fertilizer (4) for white fringed beetle control. A similar proposal is currently under consideration in Alabama. Present plans are to permit its sale only in areas infested by the white fringed beetle. In North Carolina (11) and Virginia (3) special permission may be granted for mixing insecticides with fertilizers by the Commissioner of Agriculture if the product bears the label "Customer's Mixture".

The Fertilizer Laws of Louisiana and Arkansas, Mississippi (12), Tennessee, and Kentucky contain no provision at present for the inclusion of insecticides in fertilizers.

Blending a Problem

WHEN insecticides are added to fertilizer, problems in proper blending arise. The difficulty of obtaining a uniform mixture of one or two pounds of insecticide concentrate with 1500 pounds or more of fertilizer is obvious. The pre-dilution of the concentrate in a small portion of the fertilizer or an inert dust base facilitates more uniform blending. Because of the numerous fertilizer formulae and rates of application, a comparatively large number of insecticide-fertilizer combinations may be necessary.

There has been no report of biological advantage or disadvantage in using commercial fertilizer as a vehicle for applying insecticides for soil insect control. This, however, may not be taken as evidence that disadvantages may not be shown by further investigation. Certainly the principal and perhaps its sole advantage lies in the economy and simplicity of applying the insecticide.

Certain limitations upon the use of fertilizer as a vehicle for applying insecticides must be recognized. Some of the organic insecticides lose their effectiveness in an alkaline medium and are limited to incorporation with neutral or slightly acid fertilizers. The usual practice of applying fertilizer under or near the seed drill requires that the insecticide possess vapor pressure sufficient for it to become redistributed over a somewhat greater area in the soil. It has been demonstrated that the white fringed beetle larval population was greater between rows than in the drill row where the insecticide was applied. It has also been demonstrated that, pound for pound, broadcast applications of insecticides are more effective than drill row applications.

Requirements to be Met

IN order for fertilizer to serve successfully as a medium for the application of insecticides, several requirements must be met. The stage of the insect to be controlled must be present in the soil at the time the fertilizer is applied or within a reasonable time thereafter. The habits of the insect must be such that it will likely come in contact with the insecticide at or near the point where the fertilizer is placed. For example, a drill row application placed several inches below the surface for wireworm control would be relatively ineffective for ant control. Less insecticide per acre is needed for control of surface feeders than for insects which forage beneath the surface.

There is considerable skepticism in the minds of some regarding the use of organic insecticides in fertilizers or otherwise for the general control of soil insects. Surely, a basis exists for this skepticism in light of the phytotoxic qualities of several of the organic insecticides (5) and experiences with BHC imparting off-flavor to certain crops. Perhaps even fuller justification for such skepticism lies in the fact that the ultimate stability of these chemicals in the soil and their influence upon plants and animals are not adequately known. The stability of these compounds is illustrated by a surface application of 25 pounds of DDT dust for Japanese beetle control which showed no significant change in effectiveness for at least five years (8). On the other hand, it has been demonstrated that the insecticidal effects of 1.5 and 3 pounds of DDT on the white fringed beetle (23) were materially depleted

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How North Central Weed Conference Area Has Made Use of 2,4-D and 2,4,5-T

by
L. M. Stahler
Senior Agronomist, B.P.I.S.A.E., USDA
State College, Brookings, S. D.

IN compiling information for this discussion, field observations have been supplemented with a comprehensive survey of actual acres treated with herbicides in the fourteen Central States and the three Prairie Provinces of Canada. Questionnaires of this survey were directed to the most qualified observers in the respective areas, and complete confidence can be placed in the data of the survey which resulted. A summary of these data is presented in Table 1.

Results of the recent survey indicate that whereas 22-½ million acres in the North Central Conference area were treated with 2,4-D in 1949, 25-¾ million acres were treated in 1950. These figures will be contrary to local observations of those who operate in areas where field use of 2,4-D was markedly curtailed in 1950. Data for 1950 indicate that Texas, Wisconsin, Missouri, Indiana and Michigan showed increases in acreage treated over 1949; while Oklahoma, Kansas, Nebraska, Minnesota, North Dakota and South Dakota showed decreases. Such decreases ranged from 50% in some states, to only a few percent in others. Ohio, Illinois, and Iowa treated approximately the same acreage in 1950 as in 1949. The Canadian Provinces of Manitoba, Saskatchewan and Alberta show the greatest increase in treated acreage over 1949 and it is this substantial additional acreage that accounts for the greater total area for the region despite substantial decreases in some of our winter wheat area states.

Great Increases Shown

THE extent of increased use of 2,4-D in the three Canadian Provinces in 1950 is phenomenal. In 1949, the three Provinces treated a combined total area of 8,200,000 acres—in 1950 they reported a total of 13,654,000 acres treated with 2,4-D. To further accent the volume of use of 2,4-D in these three Provinces it should be emphasized that acreages reported in 1950 (13,654,000) comprise more than half of the total treated in the combined area of the 14 North Central States and the three Provinces. Saskatchewan alone reports 8,728,000 acres treated for weed control in 1950. On the basis of total harvested crop land in Saskatchewan, 38% of their acreage was treated with 2,4-D in 1950. Manitoba reports indicate 28% of their crop land treated with 2,4-D; Alberta, 21%. On the same basis South Dakota—which leads all states this year with 2-¼ million acres treated, covered only 13% of its total harvested acreage; North Dakota 9%; Minnesota 8%; Iowa 7%; and all other states in this area report less than 5% of their total crop acreage treated with 2,4-D in 1950.

In all States and Provinces in this area the use of herbicides for control of weeds on non-cropped land is gaining noticeably in popularity. Use of 2,4-D and 2,4,5-T for control of brush and stump sprouts on railroad rights-of-ways, under power and communication transmission lines and along highways is rapidly replacing hand cutting in Ohio, Michigan, Illinois, Missouri and other states where brush and timber are the dominant weed problems on these situations. Minnesota—with one of the most vigorous and effective state weed control organizations in the United States and the most thorough and complete annual survey of weed control practices, indicates 22,000 miles of state, county, or township, maintained highways treated with 2,4-D in 1949; 33,000 miles in 1950.

In 1949 ten states in this region, reporting on aerial spraying, indicated 2,615,000 acres on which 2,4-D was applied by plane. In 1950, the same ten states reported only 1,751,000 acres treated by plane—a decrease of 864,000 acres, or 33%. In the three Canadian Provinces only 30,000 acres were reported treated by air in 1949; 81,000 acres in 1950. All States and Provinces reported a great increase in number of ground operated sprav rigs in 1950, and they further invariably forecast an additional greater number will be purchased by farm and ranch operators in 1951. The

greatest increase, both reported and predicted, of ground operated rigs has been indicated for States and Provinces in the northern spring grain and corn areas of this region. Minnesota reports 19,000 operated by farmers in 1950. In the Southern States, and in the winter wheat, rice, and brush areas, airplane application of 2,4-D more than held its own in 1950. In Texas with 500,000 acres treated in 1950 as compared to 130,000 acres in 1949, 77% of the 1950 area was treated by plane. In Oklahoma 60% of the 335,000 acres reported were treated by planes; in Kansas 50% of their reported 750,000 acres were treated by plane and Nebraska reported 900,000 acres, of which 22% was applied by plane.

Factors Involved

IN order to clarify the picture of 2,4-D use in 1950 let us examine factors that brought about increases, or decreases in specific States or Provinces. In Texas where the 2,4-D acreage was tripled in 1950 as compared to 1949, aerial spraying of 2,4-D in rice has become well established as a standard procedure in the production of this crop. During the past two years aerial spraying of winter planted flax in Texas has likewise become well established. Developments in range brush control have in 1950 encouraged a large number of ranch operators to treat experimentally a considerable acreage with 2,4,5-T by plane. With latest developments of the Spur, Texas Station in mesquite control, it is reasonable to predict that an additional one million acres of mesquite alone may be aerial sprayed in Texas in 1951. On this basis of these considerations, prospects for aerial application with 2,4-D or 2,4,5-T in Texas look very bright for 1951 and succeeding years. Except for the application of herbicides to winter sown flax, or winter wheat, the future potential wide acreage use of 2,4-D and 2,4,5-T in Texas is almost limited to aerial application.

In Kansas, Nebraska and Oklahoma the major proportion of the acreage treated ith 2,4-D in 1949 was growing winter wheat. In 1950 due tn dry early spring conditions,

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Table 1.

Total acres treated with 2,4-D or 2,4,5-T in the fourteen Central States and three Prairie Provinces of Canada in 1949 and 1950; also acres, and percent of total acres, treated by aerial application, and estimated pounds of 2,4-D, or 2,4,5-T used in weed control practices in States or Provinces of the area in 1949 and 1950. Data of this table were secured through the cooperation of research, regulatory and extension weed workers in the respective states and provinces.

State or Province	Area treated in 1949:	By Air:		Area treated in 1950:	By Air:		% total crop area treated in 1950.	Pounds 2,4-D or 2,4,5-T used [1] [2]	
	Total acres (000)	Acres (000)	% of total	Total acres (000)	Acres (000)	% of total:		1949[2] (000)	1950 (000)
Texas	130	90	70.0	500	385	77.0	2.0	90	380
Oklahoma	600	350	58.0	335	200	60.0	2.5	360	270
Kansas	1,500	850	57.0	750	375	50.0	4.0	750	450
Nebraska	1,282	320	25.0	900	200	22.0	4.5	720	560
Missouri	300	.....	....	350	.....	....	2.6	180	280
Ohio	100	.....	....	100	.....	....	1.0	65	100
Indiana	250	10	....	350	10	....	3.0	250	350
Illinois	1,000	100	10.0	1,000	20	2.0	5.0	600	690
Michigan	8	.....	....	50[1]	.....	....	0.6	6	40
Wisconsin	200	5	2.5	350	5	2.0	3.0	100	180
Iowa	1,500	150	10.0	1,500	50	3.3	7.0	800	900
Minnesota	2,245	80	4.0	2,000	50	2.5	8.0	1,500	1,500
North Dakota	2,990	350	12.0	1,800	150	8.0	9.0	1,490	1,000
South Dakota	3,000	400	13.0	2,236½	100½	4.5	13.0	1,500	1,100
Manitoba				2,022	10		28.0		1,300
Saskatchewan	8,200	30	0.4	8,728	45	0.6	38.0	4,800	4,000
Alberta				2,904	26		21.0		1,600
Area Total	22,740			25,975½	.....			13,211	14,600
Canadian total[3]	8,200	30		13,654	81			4,800	6,900
14 U. S. States total	14,540			12,321½	.....			8,411	7,700

[1]Estimated by the author.
[2]Estimates of consumption of 2,4-D and 2,4,5-T are weighted to compensate for the wide variation in rates of application used in the indicated areas. Thus, in brush control from ¾ to 10 pounds acid of 2,4-D or 2,4,5-T may be used, while in selective treatment of mustard in flax ¼ pound acid per acre is commonly employed.
[3]Three Prairie Provinces.

Special Plane Applies PESTICIDES and FERTILIZER

YEARS of study, observation and planning for an "ideal" airplane for specific use of the aerial duster and sprayer, have resulted in the construction of a special slow-flying machine at Texas A & M College. The machine, having undergone test flights successfully, is now being eyed by custom operators and others interested in aerial application of pesticides and fertilizers to determine whether it will perform according to plan.

Fred E. Weick, director of the Personal Aircraft Research Center at Texas A. & M., which built the plane, has released a brief history of the operation which covered the year between December, 1949, and December, 1950. The ship was designed and constructed under a C.A.A. contract which became effective late in 1949. Personnel from the C.A.A., the U.S.D.A., two airplane manufacturers and the Texas A. & M. College System were assigned to the project at various periods. Completed except for dusting and spraying equipment, the machine was first flown on December 1, 1950. Flight tests and adjustments were continuing in March, preliminary to C.A.A. approval.

A number of features on the plane are said to make it much more suitable for spraying, and dusting than the conventional aircraft. In the first place, the pilot is able to view the ground immediately ahead of and below him. Powered by a 225 HP engine, the plane has a large degree of maneuverability, enabling it to pull up sharply and make sharp turns at the end of a run without stalling or mushing or losing lateral control, according to Mr. Weick's description of the ship.

A load of 800 pounds can be carried easily, the makers say, and provisions for an overload of 1,200 pounds have been made providing take-off and operating conditions are unusually favorable. Separate dust hopper and spray tanks are provided so that the operation may be switched from dusting to spraying at a moment's notice when conditions make this desirable. A 27 cubic foot hopper is provided in the fuselage for dust, and in addition, space has been provided in the outer wing panels for the same total hopper capacity in case it appears desirable for a more uniform or wider distribution to disperse the material from positions some distance out from the center of the plane. It is also pointed out that dust ejected from the low wing monoplane is kept a safe distance from the engine exhaust, thus eliminating possible danger from igniting inflammable dusts.

Above: New plane on first flight in Texas. Early tests indicate it is well adapted for its specialized function of spraying or dusting agricultural chemicals.

Below: Closeup of plane. Note opening in wing for putting material into hoppers.

Spray Materials

PROVISION has been made for a quick change from the use of dust to spray, and vice versa. Two spray tanks are located in the center section of the wing and fitted with

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Associations's first meeting in Florida being held April 4-6 at Miami Beach.

NAC

AVERY S. HOYT

W. MERCER ROWE

R. M. SALTER

TENTATIVE plans for the spring meeting of the National Agricultural Chemicals Association at the Flamingo Hotel, Miami Beach, Fla., announced at the middle of March, included addresses by representatives of the U. S. Department of Agriculture; State Experiment Stations; the manufacturing industry; formulators; the Select Congressional (Delaney) Committee; and the Economic Stabilization Authority.

Arthur W. Mohr, president, California Spray-Chemical Corp., Richmond, and vice-president of the NAC Association, was to preside at the opening session on Wednesday morning, April 4. Appearing on that program, according to the advance notice, was to be the Hon. Harold Turk, mayor of Miami Beach, who was to extend a welcome to the group.

Ernest Hart, president of Niagara Chemical Div. of Food Machinery Corp., Middleport, N. Y. and president of the NAC Association, was to present his semi-annual report as a part of Wednesday morning's program. His talk was to be followed by an address by Avery S. Hoyt, chief of the Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture, Washington, D. C.

A half-hour talk by Dr. R. M. Salter, chief of the Bureau of Plant Industry, Soils, and Agricultural Engineering, U. S. Department of Agriculture, Beltsville, Md., was scheduled for 10:30 Wednesday morning. At 11, Dr. A. F. Camp, vice-director in charge of the Citrus Experiment Station, Lake Alfred, Fla., was scheduled to speak. Committee reports were to follow, completing the morning's program.

A luncheon at 1 p.m. was on the schedule, with a guest speaker, Wiliard M. Fifield, director of the Florida Agricultural Experiment Station, Gainesville. A reception is planned for 6:30 that evening, with dinner at 7:30.

Thursday morning's program is to feature a conference of formulators and basic manufacturers. Moderators of this portion of the program were listed as W. Mercer Rowe, vice-president of Flag Sulfur & Chemical Co., Tampa, Fla., and B. C. Manker, sales manager of the Michigan Fertilizer Co., Lansing, Mich.

President Hart was scheduled to preside at the

Holds spring meeting at Flamingo, Miami Beach

ERNEST HART

Friday morning meeting, on which were to appear representatives of committees of the NPA and other governmental organizations.

W. R. Allstetter, deputy director of the Office of Materials and Facilities, Production and Marketing Administration, U.S.D.A., Washington, was to speak; as was a representative from the Select Congressional Committee (Delaney Committee) which has been investigating the use of chemicals in food products.

L. N. Markwood, of the Chemical Division of the National Production Authority, Washington, was listed, as was Cedric Gran, Chief of the Agricultural & Chemical Fertilizers Section of the Economic Stabilization Authority. Topics of their talks had not been announced at press time, but it was presumed that each would speak on the supply outlook for agricultural chemicals.

Lea S. Hitchner, executive secretary of the NAC Association was to appear Friday morning, with his report, which would be followed by a group of other reports by committee chairmen. Adjournment was scheduled to be called at 12:30.

A. W. MOHR

CEDRIC GRAN

Report on Delaney Committee activities; the raw materials and general supply situation; U. S. Department of Agriculture representatives; experiment station personnel and speakers from industry all scheduled to appear on program

B. C. MANKER

Problems facing canning industry in achieving an adequate

Pest Control

THE men who first used Paris green some eighty years ago for the control of the Colorado potato beetle little realized what an important era they were initiating in insect control. It has been through the use of chemicals formulated as insecticides that many of today's consistently high yields of commodities have been made possible. We realize that pest control is only one phase of production, but in many instances it may be a limiting factor. No matter how well the ground is fitted, how good the seed, how complete the fertilizer, if insects and plant diseases are not controlled, many crops cannot be produced profitably or in a condition fit to be marketed. With the all out demands for maximum production during the last war, many American farmers realized for the first time the extent to which insecticides were of value to them. Now we seem to be in a period when peak production is again being called for, and with labor as one of the scarcest commodities, the farmer must adjust his schedules to make the most of his time and effort. We may face shortages in supply of some pesticides which will cause careful consideration of alternate materials that must fit into control programs.

If I may draw on experience close to home for a moment, I would like to describe a part of our New York program with the canning industry. Some three years ago the Association of New York State Canners asked the administration of the New York State College of Agriculture at Cornell University if the latter would undertake a two weeks training school for selected field men from various member organizations of the New York State Canners. Thereupon, Cornell set up a course for these practical field men, trying in an attempt to explain something of the basic problems of entomology, plant pathology, agricultural economics, plant breeding, and vegetable crops production. After the basic work, the course dealt with specific problems on canning crop pests, for example, pea weevil, pea aphis, cherry maggot, corn earworm and the like. An opportunity was had to discuss the pros and cons of the newer insecticides, the residue picture, safety precautions on use, off-flavors, and so on. Movies provided an opportunity to bring out the principles of some of the newer application equipment. Obviously, great benefits were gained from exchanging ideas with these industry representatives, as was a better appreciation of their points of view. It is likely that they, too, left with a broader concept of some of the problems of pest control which will benefit them in their day to day contacts with farmers.

Mutual Responsibility

WE are living in an age where *perfection* is the goal. The consuming public demands produce of top quality and free from pests or pest injuries. From the viewpoint of the canning industry, attaining this goal is a joint responsibility of its own field staffs, the farmers, the Extension Service and research staffs of government and industry. It is industry that supplies the insecticides and application equipment, the research workers of all groups who evaluate them, and in turn the Extension Service and technical service men of these agencies that bring home to the grower the recommendations on use within a given area. Last, but not least, it is the grower himself who must either apply these control measures or employ someone to do it for him.

Since 1939, the Department of Entomology, Plant Pathology and more recently Agricultural Engineering of the Geneva and Ithaca Stations of Cornell University have held an annual conference about mid-November each year for the purpose of presenting to the agricultural pesticide and application equipment industries in New York agriculture, the highlights of the current season's research and pesticide recommendations for the coming year. The conference gives the industry an opportunity to know how their materials performed in the season's experiments and also early notice of our recommendations in the event they plan to supply materials to growers in the state. It is another phase of the cooperative program which is becoming increasingly important in the complicated picture of pest control.

There is need for a better understanding on the part of some growers of the necessity for producing crops free from insect infestation where these crops are to be sold for processing. Last fall I watched a freezer plant reject brussels sprouts and broccoli based on the analysis of the samples for contamination by cabbage aphis. It was not a pleasant experience for either the producer or the processor. Both wanted to do

Program

by
Dr. Charles E. Palm
Dept. of Entomology,
Cornell University,
Ithaca, N. Y.

(From paper presented at National Canners Convention, Chicago, Ill. Feb. 20,1951)

business. The loads of sprouts and broccoli that were rejected reduced the pack of the processor and did not make the farmer very happy either. One grower remarked that no one ever heard of sprouts being grown without a few lice and hereafter he would sell to the fresh market. The processor felt that he should not be held to certain purity standards when the fresh market accepted produce below those standards.

The solution to the problem is one of better understanding and planning. Growers will have to learn that their produce for the processor must meet certain standards of freedom from insect contamination. In order to meet them, a control program will have to be planned and carried through from the time the plants are set in the field until harvest, treating for insects even before the bugs exist. If they wait until aphids appear before they begin to treat, it may be too late.

The insecticides they will use need to be chosen with relation to possible residues at harvest. Their sprayers must be adapted to hit the under side and lower parts as well as the tops of the plants. They must have schedules for application worked out in advance. With joint effort between the grower, canner's field men and the Extension Service, a problem of this type can be solved satisfactorily for all concerned.

Basic Considerations

THERE are certain basic considerations relating to pest control that the processor must consider. He needs a top quality product free from injury, residue and pest contamination in order to maintain purity standards. In New York we have two types of responsibility for insect control, one in which the canner assumes primary responsibility for organizing, timing and applying the insecticide program. This is illustrated by the control program for the pea weevil where the canners employ field entomologists to determine the infestation and direct the plane applications for its control. A similar situation exists with the pea aphis. The other and more general type of responsibility rests with the individual grower, and is well illustrated by the control of cherry fruit flies on cherries grown for processing. One should add the custom operator who will apply insecticides for either the canner or the grower and you have a field of operations that is expanding rapidly in some areas. In Florida and California, grower cooperatives also provide their own pest control services for their members. This type of operation seems to be particularly effective in the control of citrus pests.

One of the responsibilities of the Experiment Station and Extension Service is the preparation of recommendations for insect control to suit the major needs within the state. The farmer is not organized on a corporation basis, and through the years he has helped build up his state colleges and experiment stations to work as a public agency to evaluate his problems impartially. Speaking as a member of one of these stations, I can truthfully say that we feel a responsibility to all growers and processors, and in fact, we desire to be of help to anyone who has an agricultural insect problem. There are certain uses of some of the newer insecticides on produce grown for the fresh market which may not be in accord with the thinking of the processor. To be specific, a material like BHC may fit as an alternate recommendation into the delayed dormant schedule for the control of rosy aphis on apples, before the fruit is even in the blossom stage. The processor may object to the purchase of apples from trees treated at any time with BHC with the thought that sooner or later some off-flavor may develop. I feel that the Extension Service has a perfect right to include BHC in its recommendations for those who may need it, but at the same time it has the responsibility to point out to all growers who plan to sell their crops to processors that BHC should not be used in their schedules. To accomplish this type of program a close liaison must be maintained between the processors, the research and extension workers,

to make known the restrictions that may be placed on a given material because of off-flavor, lack of suitable analytical methods for determining residues or other logical reasons. We in the stations have had wonderful cooperation thus far and hope that as the food processing industry develops new methods for insecticide residue determinations, we may be kept informed, since they may have a bearing on future recommendations.

Another type of research program that exists to some extent between the canners and the state and federal stations is the probing of possible problems that might cause trouble in the future. We have been glad to cooperate with the National Canners Association in treatment of experimental blocks of various crops with different insecticides. When harvested, these were carried through commercial processing procedures and then put to various tests for flavor, etc. Similar cooperation has been used to investigate the possibilities of pest contamination. Many of our experiment stations have pest control programs in cooperation with the Divisions of Food Processing and Home Economics, where cooking tests and taste panels are an integral part of the pest control research. This is particularly true of insecticides used in the soil for the control of wireworms, grubs and other pests. In New York we have trouble with our native white grubs in strawberries.

In an effort to improve on the recommended control with lead arsenate treatment at setting time, a number of organic insecticides are being tried. The program expands beyond the determination of insecticidal efficiency of a given material. Each material has to be checked for possible effect on the flavor of the fresh berries and the flavor of the canned and preserved fruit six months after processing. Probably chemical residue determinations will be made on the berries to see if there is absorption of any of the materials. After this program is carried through with strawberries, then consideration must be given to other canning crops that may be grown in the rotation on land that may be treated. In the area of which I speak, green beans and tomatoes fit into the rotation. This example may serve to illustrate what is happening in many areas in trying to anticipate trouble with pest control recommendations and be in a position to avoid it.

Application a Problem

APPLICATION of insecticides poses a safety problem which is of growing importance, namely safety to the operator and avoidance of insecticide drift to areas beyond the boundaries of treatment. The responsibility for this safety program in the use of insecticides may be on the canner if he is conducting the program. Pollination of many crops is largely dependent upon insects. The honey bee is the species most widely used to insure adequate aid in the set of fruit, beans and other crops needing pollinators. A number of regions of the country have already had trouble from bee poisoning due to the drift of toxic materials into areas where bees were working. In New York after a joint conference with beekeepers and fruit growers, the Extension Service eliminated lead arsenate in the pre-blossom spray schedule for apples and thus corrected one of the most serious sources of bee poisoning.

Now we are concerned with summer applications of several of the newer organic insecticides since much of our farming is cut up into small acreages of diversified crops and drift can easily go over into pastures or forage crops. Lawsuits are bound to arise from growers who do not wish to have their pastures or other crops 'treated' accidentally by drift from their neighbors' application. Dust formulations applied by aircraft can pose a problem along this line. I feel that insecticide drift is one of our increasing problems that is a long way from being solved and it deserves careful, constructive attention from the extension service, the canner, the custom operator and the farmer who may be applying the materials.

There have been several deaths and near deaths in recent years from the use, or perhaps I should say, mis-use, of a few of the more toxic of the newer insecticides. Industry has taken a definite and commendable step in labeling, cautioning, in fact asking that unless proper precautions for safety can be observed in applying a given material that it be returned; yet there is still a tendency on the part of those applying insecticide to depend too much on their own experience and be satisfied if they are lucky—to feel that the use hazards are overstressed. It gives one the creeps to see a plane crew handling a phosphate insecticide without respirators and see the pilot's exposed face covered with a dusty layer of the insecticide as he wipes off his goggles while the crew loads the hopper for the next trip. The program for safe use is as important today as ever, perhaps more so, since there appears to be a growing carelessness in handling some materials as people escape injury. We have had the

Problems of pest control for canning food include those of application, control of insecticide drift; avoidance of all fragments of insects; and elimination of toxic residues on foods at the time of harvesting

story thrown back that 'you said that about DDT at first, but nobody got hurt with it either.' Where it is possible to demand safety precautions, they should be demanded. We must continue with an educational program and urge safe use of toxic chemicals.

Contamination Sources

GROWERS in producing for processing are naturally interested, as is the processor, in quantity and quality of the crop. Both want to do a good job and make a little money if possible, and there isn't anything wrong in that either. There are definite plans in a growers' schedule for production of a crop for processing that may differ from those that might be used if the crop were going to another market. These cut across the board in fertilizer practices, varieties, time and method of harvest, selection of pest control methods, and so forth. Perhaps the finish on canning fruit, for example, does not have to be as high as for fresh market competition. It is my understanding from visiting in citrus areas in Florida that this is true with oranges and grapefruit and certainly it is true for apples in our own area. We still recommend lead arsenate for cherry fruit fly control on cherries for processing because growers can apply it with confidence of control and processors know that they can remove any residues before processing the fruit.

I see no reason to change from older, established methods of pest control unless there is a definite and particular reason, nor is there need for paying for extra finish when it does not in any way improve the quality or quantity of the product for processing. It is interesting to note that for a three year average, 1946-1948, in New York, the following percentages of our fruit crop went to the processing market: apples, 48 per cent; pears, 0.4 per cent; sour cherries, 88 per cent; sweet cherries, 80 per cent; grapes, 90 per cent; peaches, 0.0 per cent. We have kept these facts in mind in developing spray programs for pest control.

The matter of fragments as they affect purity standards is a problem that is important. Contamination can occur from infestations during production of the raw products or during the time of processing. The entomologist is working with the producer to minimize his cause for trouble and with the processor to prevent infestations around the processing plants. It is, and always will be an ever present problem, since insects are as much a part of this world as man himself. Because of the necessity for purity standards of the highest type, all ways to reduce possible sources of contamination must be under continuous scrutiny along the production and processing lines of operation.

How About Residues?

WE have heard about chemical residues on crops at harvest and their possible toxic effect to man and other animals consuming them. National attention was given to residues of arsenic, lead and flourine on apples in the late twenties and up to the present. With the tremendous development of new pesticides during the past ten years, residues have become a prime question. The entomologist is interested in killing insects but fully recognizes his responsibility for making pest control recommendations that are in the interest of the public health. After all, he too is a consumer and expects high purity standards in the food he buys for his family. Without reviewing the events of the past twelve months, we may recall the Hearing held by the Food and Drug Administration in Washington as a part of its responsibility under the Food, Drug and Cosmetic Act, to accept evidence as to the need for use of pesticides on fresh fruit and vegetables, materials used, dosages recommended, residues at harvest and other pertinent information. Everyone who had something to contribute to this Hearing had the opportunity to do so. The most complete set of data available anywhere in the world on this problem is now compiled and is being studied. Further, I think everyone welcomed the thoroughness of the job and became better acquainted with the many angles to it.

Entomologists must rely upon the toxicologists, pharmacologists, and other specialists to determine safe levels for intake of a given chemical. Not only is there the acute, but probably more important to consider, the chronic toxicity of small amounts of a chemical taken frequently. Fortunately the chemists, entomologists and plant pathologists have anticipated the need and possess data pertaining to residues on various crops that have been treated with pesticides, in many parts of the country. In our own case, we have much data for guidance when tolerances are announced by the Food and Drug Administration, as to what application schedules will be permissible to meet these tolerances under New York conditions. Similar data in other areas will be of like value to their growers. We have learned much about uniform sampling techniques, analytical methods that give reliable results and further the rate of residue loss from growing crops that can be attributed to growth, weathering and a combination of these factors. In lettuce, for instance, rapid plant growth shortly before maturity is responsible for substantial residue loss as determined on a weight basis of the harvested crop.

Many of us have been following the investigations of the Select Committee to Investigate the Use of Chemicals in Food Products established by the eighty-first Congress under the Chairmanship of Representative James J. Delaney. Testimony has been received from seventy-four witnesses. In view of the far-reaching consequences of the proposal before the committee that a chemical or synthetic should not be permitted to be used in the production, processing, preparation, or packaging of food products until its safety for such use has been established, and that the food chapter of the Federal Food, Drug, and Cosmetic Act should be amended to include a section generally similar to the New Drug Section of that act, it was pointed out by the Commit-

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Insects' fight for survival seen in phenomenon of

"BEES' STRUGGLE"

by

Dr. E. E. Leppik

Augustana College
Sioux Falls, S. Dakota

OBSERVATIONS on the effect of insecticides on bee populations have been made in many parts of the world during the past several years, particularly since the advent of powerful newer organic toxicants into the agricultural pest control picture.

At the state horticultural college of Bavaria, German biologists have made a study of how "E-605" influences the nervous systems of different groups of organisms. This material, basis for parathion, was used in experiments with honey bees, bumblebees, wasps and ants. The discovery of several new instincts and habits of insects has resulted from this study which has been in progress for a number of years.

Two main observations were noted to be of unusual significance in calculating the effect of insecticides on bees:

1. Continuous chain-like transferring of poison from one insect to another.

2. The excitement and confusion of an entire bee colony due to the presence of a few poisoned bees. This latter phenomenon is called "Bees' Struggle".

The latter observation; the fact that the bees can transfer poison from one to another, was first observed in nature and later established by several experiments. Ten bees which came into contact with flowers treated with "E-605" were able to poison up to a thousand other bees, and thus to destroy a whole colony. The toxicant was distributed in the hive like a "chain reaction" from one bee to another. Similar action was also observed in wasps, bumble bees and trophollactic ants.

While this transferring ability of some toxicants presents an opportunity to develop highly active insecticides against wasps and ants, it also illustrates how such materials, if improperly used, can be destructive to bee populations.

Above: The author (left) and instructor O. Palm, co-observers of transfer of poison.

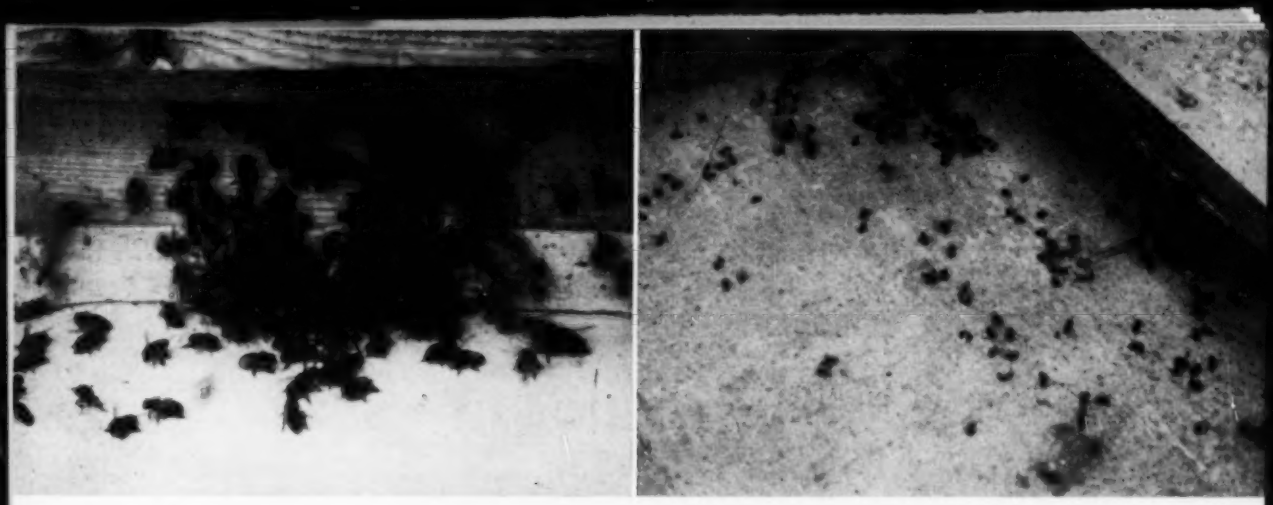
Below (L): Ten test bees from colony are marked with white spot, then placed in test-cage where they contact flowers previously dusted with insecticide. Marked bees are then allowed to return to their home hive.

Below (R) The returning 10 bees are allowed by sentries to enter hive which is still quiet and only a few bees are seen at entrance.

"Bees' Struggle"

BEEKEEPERS in Bavaria noted peculiar actions of their bees following applications of "E-605", and upon investigation discovered that the bees in some hives would suddenly become very excited, killing each other and attacking any human being who came near the hive. The beekeepers termed this phenomenon the "Bees' Struggle," but knew little about the inside story in connection.

Later, however, "Bees' Struggle" was demonstrated through experiments under controlled conditions. Ten bees were marked with white spots and were permitted to



suck the nectar from flowers which had been treated with toxicants which affect nervous systems. The poisoned bees returned to their hive normally, and the guard bees made no effort to stop them from entering the hive.

Once inside, however, the poisoned bees were soon recognized as being of great danger to the entire hive. The other bees, upon identifying the source of potential trouble, attacked the offending ones, drove them out of the hive and killed them. But the chain-like distribution of poison from bee to bee had already started within the hive and more and more of the members were affected. As soon as such bees were detected, they were immediately set upon by the un-poisoned ones and severe fighting was soon in progress between the two groups. As the number of affected insects increased, the chaos within was stepped up until the entire colony was in a very excited state with numbers of irritated bees nervously flying around the hive stinging any person who tried to approach. The entrance to the hive was blocked and no bees were allowed to enter. On one occasion, even the Queen bee was killed.

The struggle continues until all poisoned bees are driven out and killed, or until the greater part of the bees are infected by the poison, transferred by others. After such a struggle, the area surrounding the hive is covered with dead bees.

Why the Bees Fight

SUCH a struggle described above cannot be regarded as a fight between individuals as a human being would look at it, for not the least attention is paid to the death of individuals in the hive. These struggles are in full keeping with the instincts of the bees as a desperate fight for the *existence of their species*. This is also observed when epidemic diseases are spreading in a beehive, even if not to the same extent nor of a comparable violence as is seen in the "struggle".

Above (L): in 30 minutes, furious attacks are in course. A large number of bees have gathered in highest excitement at hive entrance. In foreground, several sound bees have surrounded poisoned marked bees and are killing them.

Above (R): By evening, the floor in test-cage is thickly covered with dead bees.

Conclusion

These experiments point clearly to a possible new research trend in the field of agricultural chemicals. There is a good reason and scientific basis for the development of highly effective chemical weapons against agricultural pests. But as is well known, the improper mass use of such toxicants can lead to unpredictable losses to agriculture and horticulture. Although bees are not the single useful insect necessary for the production of food and fiber, they are under human control and may thus be protected rather easily against misuse of insecticides. Other valuable insects, however, the pollinators, predators etc., are relatively unprotected against potent insecticides.

Once more proper use of insecticidal materials is emphasized in order to protect valuable insects such as bees and certain predators. New organic toxicants, when applied wisely, are not necessarily death to all insects. Timing applications to avoid contact with bees, important.

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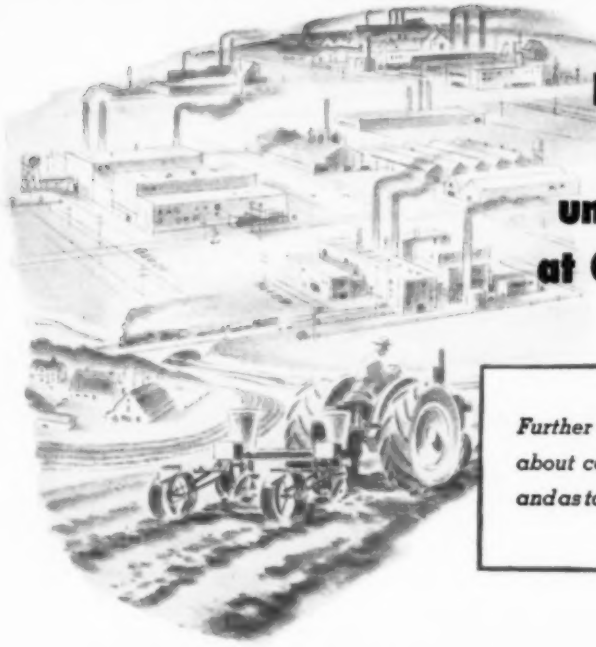

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The Sulfur Situation

By

Langbourne M. Williams, Jr.*

President, Freeport Sulphur Co.,
New York

THE salt dome deposits of the American Gulf Coast region are but one of the many sources of sulfur. These sources include deposits of brimstone not of salt dome origin, which occur elsewhere in the United States and in Italy, Sicily, Japan and other foreign countries. They also include deposits of pyrites, which is an inclusive term denoting the metallic sulfides. Pyrites deposits occur in a number of places in the United States and in Spain, and a great many other countries.

Secondary sources of sulfur also include sulfur dioxide in waste gases at copper, lead and zinc smelters. They include hydrogen sulfide in sour natural gas and in waste gas at oil refineries. They include deposits of gypsum and anhydrite found in many parts of the world. And they include also the sulfur content in coal.

During 1950, the world used about 11-½ million long tons of sulfur in all of these forms. The brimstone producers in the United States produced roughly half of that amount, about 5,350,000 tons.

These secondary sources do not necessarily yield sulfur in the form of brimstone, but the forms they produce may be used for virtually every purpose which sulfur serves. Four-fifths of the world's sulfur goes into the manufacture of sulfuric acid, and sulfuric acid may be made from any of these sources as a raw material. They are, in effect, interchangeable.

In the United States, brimstone is now the principal source of sulfur for sulfuric acid. But this was not always the case. Back in 1910 only about five per cent of all the sulfuric acid used in the United States came from brimstone, and the rest came from pyrites and from acid in smelter gases. Beginning about the time of the first world war, we began to make more and more of our acid from brimstone, and now about 80 per cent of all the sulfuric acid that is made in the U. S. comes from brimstone. The rest is made from pyrites, from smelter gas, and from hydrogen sulfide.

The production of brimstone in the United States has increased substantially. Output in 1950 was almost two and one-half times as great as the average annual output during the prewar period 1935-39. It amounted to 5,350,000 long tons, practically all of which came from the mines on the Gulf Coast.

The increase in the production of brimstone was achieved in a number of ways. Our company and others expanded their sulfur mining facilities. Other mining plants were operated at higher capacities. Sulfur producing companies have always spent large sums of money on prospecting and exploration, and these efforts led to the discovery of new deposits and the opening of new mines. In addition, new sources of brimstone, such as recovery of sulfur from hydrogen sulfide gas, were brought into production.

How does the gain in brimstone production that resulted from these efforts compare with the gain in other industrial output during the corresponding time? Brimstone output in 1950 was almost 150 per cent above the 1935-39 average. General industrial output in the United States was about 100 per cent higher. Output of minerals was only about 50 per cent higher than the 35-39 average.

The brimstone gain compares favorably also with the gain in production of some of our other basic industrial commodities. Compared to the increase in brimstone output of almost 150 per cent, production of steel went up only 108 per cent and crude oil rose but 68 per cent.

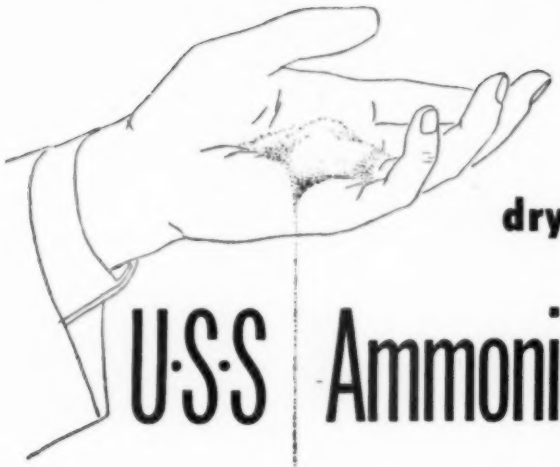
Less From Other Sources

PRODUCTION of sulfur in other forms from other sources, however, has lagged far behind the production of brimstone. The world output of sulfur in the form of pyrites in 1950 was very little higher than it was in the 1935-39 period. The total production throughout the world amounted to approximately 4,600,000 long tons of equivalent sulfur—an increase of only six per cent.

In 1935-39, pyrites accounted for about 4,350,000 long tons of sulfur a year—or slightly over one-half of the world total of sulfur from all sources. During that period, United States brimstone accounted for about 2,175,000 long tons per year —or somewhat over one-fourth of the total. In 1950, the output of pyrites, although about a quarter-million tons above the 1935-39 average,

(*Turn to Page* 118)

*Based on testimony before House Subcommittee on Fertilizer & Farm Machinery Washington, D. C., Feb. 21, 1951.



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Placement of Liquid and Dry FERTILIZERS

By O. A. Lorenz*

HOW does the placement of fertilizer materials affect the yield of certain crops? Here are some data obtained in such experiments over the past few years, showing clearly the advantages and disadvantages of different types of placement.

The tables included with this article cover first some of the work done with placement of dry materials, then data contrasting placed dry materials and materials applied in the irrigation water.

Table 1 summarizes data from five experiments with transplanted onions grown near Shafter, Calif., over the past four years. In these tests, nitrogen from ammonium forms and phosphoric acid from treble superphosphate, were used. The fertilizer was placed 3 to 4 inches below the surface of the bed. One should note how consistent the results were in these tests from year to year. In every test, the highest yields were obtained from placement directly under the plant row and the poorest yield from placement in the center of the bed. This latter location was only 6 inches or less from the plant row and yet the big difference in yield is easily seen. Shoulder placement usually gave results midway between those obtained by placing the fertilizer under the row and in the center of the bed.

The importance of early application of fertilizer, is also strikingly shown in table 1. Late applications made two to three months after transplanting did but little toward increasing the yield, especially if put in the shoulder of the bed. But late placement, if made in the center of the bed, was very inefficient and results were often as poor as if no fertilizer at all had been used.

It should be particularly noted in table 1, that placement of fertilizer directly under the row, doubled the yield over that obtained with the use of no fertilizer, as illustrated in both the 1949 and 1950 tests. It was also in these years that best results were obtained from the most efficient fertilizer placements. In other words, the greater the need for fertilizer, the more important it is to place the material where it will do the most good to the crop.

Table 2 shows some results obtained with onions during the past year. It should be noted that the highest yields were obtained by placing the fertilizer directly under the row and next in the shoulder of the bed. Putting the fertilizer in the irrigation water in the furrow increased the yield significantly above that of fertilized plots, but the yield was still

(*Turn to Page* 115)

* From talk at California Fertilizer Association, San Diego, Nov. 3, 1950.

TABLE I

Placement	1947	1947	1948	1949	1950	Ave.
None	100	100	100	100	100	100
Transplant.	11/8	1/16	1/5	12/29	12/29	
Row	148	176	127	219	198	174
Shoulder	133	172	121	164	175	153
Center	134	154	112	131	153	137
Late	1/17	3/15	3/12	3/23	3/20	
Shoulder	115	151	103	166	122	131
Center	105	110	103	105	119	108
Diff. Req'd.	10	16	14	30	29	

TABLE II

Fertilizer placement[1]	Yield Cwt/acre
None	289
Under row	571
Shoulder of bed	507
In irrigation water	413
Difference required	83

[1] Both N and P_2O_5

TABLE III

Onions - Shafter 1950
Liquid vs. dry P_2O_5

	Yield Cwt/acre
No P_2O_5	314
P_2O_5 - under row	571
P_2O_5 - shoulder of bed	507
P_2O_5 - in irrigation water	459
Difference required	83

TABLE IV

Onions - Shafter 1950
Yield - Cut/acre

Source of N	Under row	In water
Ammonia	571	413
Urea	482	444
Calcium nitrate	432	407
None	396	
Diff. Req'd	83	

TABLE V

POTATO -Porterville 1949

	Sacks/acre
No fertilizer	118
50lb N-$(NH_4)_2SO_4$-planting	237
100lb N-$(NH_4)_2SO_4$-planting	279
150lb N-$(NH_4)_2SO_4$-planting	295
50lb N-$(NH_4)_2SO_4$-planting	277
50lb N-(NH_3) in water-60 days	
Difference required	40

TABLE VI

POTATOES - Shafter 1949

No nitrogen	268
100lb N-$AmSO_4$-planting	468
100lb N-$AmSO_4$, water, emerg.	372
100lb N-NH_4OH, water, emerg.	319
100lb N-NH_4OH, water, 6 weeks after emergence	212
33lb N-$AmSO_4$, planting	372
67lb N-NH_4OH, water, emergence	
50lb N-$AmSO_4$, planting	396
50lb N-NH_4OH, water, emergence	
Difference Required	43

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The Listening Post

Entomologists-Pathologists as Control Team

This department, which reviews current plant disease and insect control problems, is a regular monthly feature of AGRICULTURAL CHEMICALS. The comments on current plant disease problems are based on observations submitted by collaborators of the Plant Disease Survey Bureau of Plant Industry, Soils, and Agricultural Engineering, U. S. Department of Agriculture, Beltsville, Md.

By Paul R. Miller

MANY of the viruses that cause plant diseases are carried from infected to healthy plants by one or more of the different kinds of insects that feed on the plants. Control of these diseases demands cooperation between entomologists and plant pathologists, as illustrated by the sucessful experiments reported by E. P. Breakey and Leo Campbell of the Western Washington Experiment Station.

They state that for many years the yellows disease has been a constant threat to the strawberry industry of the Pacific Northwest. This is because commercial plantings in the area have been almost entirely of the highly susceptible Marshall variety. The acreage planted to strawberries in western Washington has been greatly expanded in recent years, and this expanse has been followed by a marked increase in the yellows disease with attendant decrease in yields of as much as 75 percent.

Initial efforts to control the yellows disease consisted primarily in the use of certified planting stock (with less than 1 percent infected plants) supplemented by pulling out, or roguing, diseased plants as they appeared in new plantings. Such measures were ineffective, however, unless the plantings were well isolated from infected mature fields.

Table 1.

Data on the control of the strawberry aphid—1948
Living aphids per 20 trifoliate leaves

Replicate	Parathion	BHC	Rhothane	Methoxychlor	Check
1	0	4	74	477	173
2	2	43	140	328	184
3	20	23	60	315	121
4	0	16	72	261	94
5	10	5	155	152	120
Total	32	91	501	1533	692
Average per 3-foliate leaf	.32	.91	5.01	15.33	6.92

Table 2.

Data on the depression of the spread of yellows by the use of insecticides to control the strawberry aphid—1948.

Total number of plants and number of yellows-free plants (healthy) in each of five replicates of four insecticides and untreated checks.

	Parathion		B.H.C.		Rhothane		Methoxychlor		Checks	
Replicates	Total no. plants	Healthy plants	Total no. plants	Healthy plants	Total no. plants	Healthy plants	Total no. plants	Healthy plants	Total no. plants	Healthy plants
1	226	24	220	10	214	5	249	16	235	14
2	237	67	249	24	253	14	244	8	249	16
3	230	38	245	48	261	23	261	12	238	40
4	256	44	262	32	251	6	264	6	263	15
5	262	20	282	12	276	10	256	10	271	10
Total	1211	193	1258	126	1255	58	1274	52	1256	95
% Healthy[1] plants	24.50		15.40		7.11		6.27		11.63.	
% D.Y.[2]	+12.87		+ 3.77		—4.52		—5.36			

[1]Corrected for original percentage of yellows.
[2]D.Y.—percent depression of yellows per treatment.

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Even then the results were often discouraging, since the virus spread from diseased plants to healthy plants faster than the symptoms developed and roguing was therefore too slow to prevent infection.

The development of highly effective new insecticides suggested that it might be possible to control the strawberry aphid, *Capitophorus fragaefolii*, that carries the virus, and thus slow down or stop the spread of infection. If new plantings of certified stock could be dusted at regular intervals with insecticides, growers might be able to rogue effectively and to produce the Marshall strawberry profitably again.

Screening tests in 1947 showed that some of the new compounds were not effective against the strawberry aphid. Dusts containing 5% DDT were only partially effective; moreover, DDT in amounts as low as five pounds per acre retarded the development of the plants and seemed to aggravate the spider mite problem. BHC dusts (0.5% to 1% gamma isomer of benzene hexachloride) proved to be more efficient against aphids and were non-toxic to plants. Some new insecticides, particularly parathion, were credited with a residual effect extending over a considerable period of time.

1948 Tests

IN 1948 tests were set up to determine whether periodic application of the new insecticides would protect new plantings from aphids so that, by carefully roguing all plants showing symptoms of yellows, the spread of the yellows virus could be checked. Those insecticides that had been most promising in the 1947 screening tests were tested again, along with certain others. They included the following dusts: parathion (0.5% o-o-diethyl o-p-nitrophenyl thiophosphate); BHC (0.5% gamma isomer, benzene hexachloride); Rhothane (DDD) (5% dichlorodiphenyl dichloroethane); and methoxychlor 5% bis (methoxyphenyl) trichloroethane).

A planting of Marshall strawberries was established for the purpose of these tests. The test planting was directly south of a mature field, the two being separated by a turning area that was kept clean of vegetation. A random sampling of plants in the mature field showed that approximately 35 percent were affected by yellows.

The four insecticides were treated against an untreated check; using nine 100-foot rows per replicate and five replicates per treatment. The replicates were randomized to compensate for any variations, particularly in aphid numbers, that might exist. Data were taken from the center three rows of each replicate, leaving three rows on either side for buffers. Five applications were made at intervals of two weeks, beginning one week after planting, using 8 to 10 pounds of dust per acre per application. The dusting program was terminated on July 10, soon after current infection had developed to

Table 3.

Data on the control of the strawberry aphid—1949
Living aphids per 25 trifoliate leaves

	New planting[1]		Mature planting[2]	
Replicates	BHC	Parathion	TEPP	Parathion
1	0	3	11	6
2	2	7	3	0
3	2	2	1	12
4	1	2	1	22
Total	5	14	16	40
Average per trifoliate leaf	.05	.14	.16	.40

[1]Dusted at intervals of 2 weeks beginning 1 week after setting of plants.
[2]Dusted twice before blossoming, an interval of 2 weeks between applications.

Table 4.

Data on the control of strawberry yellows by the use of insecticides for the control of the strawberry aphid in plots adjoining a treated mature field—1949.

	Parathion		BHC		TEPP	
Replicates	Total no. plants	No. yellows plants	Total no. plants	No. yellows plants	Total no. plants	No. yellows plants
1	370	65	542	56	533	40
2	525	66	528	42	531	43
3	534	69	505	74	513	49
4	403	45	415	38	369	53
Total	1832	245	1990	210	1946	185
Percent yellows	13.37		10.55		9.50	

Table 5.

Data on the control of strawberry yellows by the use of insecticides for the control of the strawberry aphid in plots in isolation—1949.

	Parathion		TEPP		BHC	
Replicates	Total no. plants	No. yellows plants	Total no. plants	No. yellows plants	Total no. plants	No. yellows plants
1	72	0	91	0	75	4
2	86	0	85	1	63	1
3	100	0	82	1	68	0
4	94	0	94	0	83	1
5	61	3	74	0	70	0
Total	413	3	426	2	359	6
Percent yellows	0.72		0.47		1.67	

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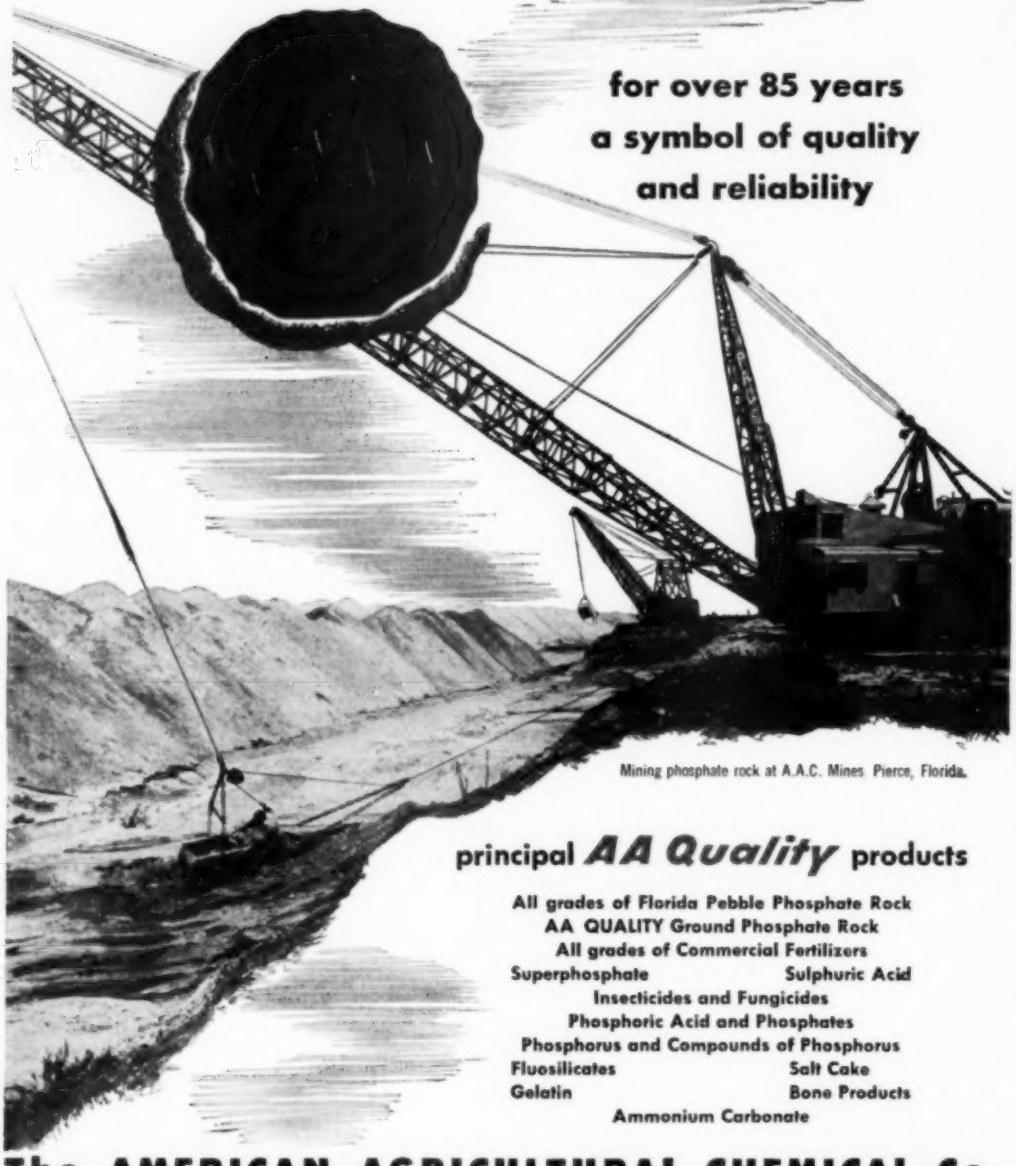

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a point where diseased plants could readily be identified. This was soon after the berry harvest had been completed. All applications were made with a powder duster mounted on a small tractor and adapted to treating three rows at a time.

Data on the effectiveness of the insecticides as controls for the strawberry aphid are summarized in Table 1. Counts were made on July 8 and 9, soon after the berry harvest had been completed. Aphid counts were obtained by picking, at random, 20 trifoliate leaves of medium maturity from the center three rows of each replicate. Since there were five replicates the living aphids on 100 leaves from each treatment were counted.

Of the four insecticides tested, parathion and benzene hexachloride were the most effective. Methoxycide contained from two to three times promote the development of the aphids. Plots treated with this insecticide contained from two to three times as many as the untreated checks. Plots dusted with the "Rhothane" and methoxychlor were more heavily infested with spider mites than were the untreated checks. Parathion gave excellent control of the aphids as well as being outstanding in the control of the spider mites.

Counts to determine the incidence of yellows plants were made on July 27. These data are summar-

(*Turn to Page* 110)

Tobacco Insect Control Suggestions

This column, reviewing current insect control programs, is a regular feature of AGRICULTURAL CHEMICALS. Dr. Haeussler is in charge of Insect Pest Survey and Information, Agric. Research Adm., B. E. & P. Q., U.S.D.A. His observations are based on latest reports from collaborators in the department's country-wide pest surveys.

By G. J. Haeussler

THOSE concerned with the control of insect pests of tobacco will be interested to know that a mimeographed report containing suggestions for the control of tobacco insects for the 1951 season, approved by the Recommendations Committee of the Tobacco Insect Conference, recently became available for distribution. The representatives of Agricultural Experiment Stations located in the principal tobacco-producing States and of the Bureau of Entomology and Plant Quarantine, who comprised the Committee, prepared this report following the Tenth Annual Tobacco Insect Conference which was held at Gainesville, Florida, on June 6-8, 1950.

This report contains suggestions for the use of those who are assisting tobacco farmers in insect control through the preparation of subject matter for local distribution. Since the methods of controlling insect pests in the different tobacco-growing areas vary to some extent, the suggestions have been separated into six separate sections as follows: Cigar Tobacco (Connecticut Area); Cigar Tobacco (Pennsylvania Seedleaf Area); Cigar Tobacco (Florida-Georgia Area); Flue-Cured Tobacco: Burley and Dark Fire-Cured Tobacco; and Stored and Manufactured Tobacco. The discussion includes suggestions for preventing and controlling infestations of various pests in plant beds and under field, packhouse, and open and closed warehouse conditions. Suggested control measures include cultural practices and sanitation, as well as the use of various insecticides in the form of sprays, dusts, and fumigants.

The Recommendations Committee gave special attention to the possibility of new insecticides introducing foreign flavors or odors in tobacco. They point out the desirability of holding insecticide deposits at a minimum since residues on tobacco are objectionable in several ways. The following statement regarding the use of toxaphene on tobacco apparently was considered of sufficient importance to bear repeating in each of the six sections comprising the report.

> "Toxaphene has been found to be effective for the control of hornworms, grasshoppers, cutworms, and the suckfly on tobacco. However, the evidence obtained to date, especially in North Carolina, South Carolina, and Georgia, shows that, under some conditions, this insecticide may have objectionable effects on the odor of the cured tobacco. This effect has been particularly noticeable when toxaphene has been applied to the flue-cured tobacco crop in heavy dosages after the plants were approximately 2 feet high. There is an indication that this objectionable odor is more likely to occur when toxaphene is used in an emulsion spray, due, possibly, to the effect of the emulsifier or solvent used in preparing the emulsion. This objectionable odor has also been reported where tobacco was treated with toxaphene dust mixture containing sulfur.
>
> "Results of recent tests show that toxaphene has caused an objectionable off-odor in flue-cured tobacco when used, during the late stages of tobacco growth, at as low a rate as 5 pounds of actual toxaphene per acre in the form of a dust, or 2 pounds per acre in the form of an emulsion spray. The samples of tobacco leaves used in these tests were carried through the regular curing, bulking, grading, redrying, stripping, aging, (accelerated), and manufacturing process, in cooperation with the research laboratory of a tobacco company. The tests showed that the odor of toxaphene could be detected in all of the samples treated with this material, when the cured tobacco was heated or was smoked as cigarettes.
>
> "In view of the above circumstances, it is believed that if toxaphene is used on tobacco it should be used with great caution. The State authorities of the various tobacco-growing areas are fully conversant with the situation. They should be consulted as to their suggestions or recommendations before toxaphene is applied for insect control on tobacco. It is understood that, at present, the use of toxaphene on tobacco is not generally sanctioned by the State authorities in the flue-cured tobacco-growing areas of North Carolina, South Carolina, Georgia, and Virginia."

The report is not available for general distribution. Individual copies can, however, be furnished upon request to those having immediate need for this type of information. Distribution of the report is being handled by the Bureau of Entomology and Plant Quarantine, Washington

Every year—yes, almost every month—the farm picture changes, as scientific research comes up with better methods and new agricultural chemicals. The last few years, in particular, have been a period of rapid development—and there is reason to believe that this will be the case for many years to come.

Dow has played an important part in advancing the role of agricultural chemicals. Not in just the last few years, but over nearly half a century, Dow has developed, tested and marketed many important chemical aids to efficient farming. Agricultural leaders have learned to rely on the "know-how" that is responsible for the uniformly high quality of Dow products.

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25, D. C. Individual States are now issuing insect control recommendations for 1951 based on the data that was presented at the conference.

Orchard Insect Problems

D. W. HAMILTON, S.A. Summerland, H. J.McAlister and J. E. Fahey of the Vincennes, Indiana, fruit insect laboratory of the Bureau of Entomology and Plant Quarantine have reported recently on developments in the control of insects and mites which attack apples and peaches in orchard areas of the midwest. Injuries by orchard mites, Forbes scale, and the red-banded leaf roller have increased in that area following the general and effective use of DDT for codling moth control. These workers report that Forbes scale is not always readily controlled by the use of dormant oil, but 15% parathion at the rate of ½ lb. to 100 gal. in 6 cover sprays has reduced several infestations in apple orchards to negligible proportions. When used in 3 applications or less, 1½ lbs. of 15% parathion to 100 gal. is required.

Although several species of mites are present in the apple orchards, they are considered in two groups—European red mite and two-spotted spider mite. Dormant oils give effective control of European red mites since these pests overwinter in the egg stage. The two-spotted spider mites overwinter as adults and are not controlled by dormant applications. The most promising materials tested in 1950 for the control of summer infestations of mites in midwestern orchards were EPN, "Aramite," TEPP, parathion, DN-111, p-chlorophenyl p-chlorobenzene sulfanate (C-1006) and s-(1,2-dicarbethoxyethyl)o,o-dimethyl dithiophosphate (4049). EPN at ¼ lb. to 100 gal. and 15% parathion at ½ lb. to 100 gal. gave excellent control of both species of mites when included in 6 cover sprays. Residues of parathion weather more rapidly and this material was less effective than EPN when used in a reduced number of sprays.

Injuries to apples by the plum curculio have increased in the midwestern States during recent years, these workers report. Methoxychlor, dieldrin, "Dilan," aldrin, lindane, EPN, parathion and lead arsenate with DDT or lindane all gave commercial control of this pest when used in the calyx and first and second cover sprays. However, these materials were no more effective than lead arsenate at the rate of 3 lbs. per 100 gals., and since that material also helps control the red-banded leaf roller and the codling moth, its use appears desirable against the average curculio infestation. Spray applications should be applied at 8-10 days and be continued throughout the period curculios are active, for good control.

In general, 3 broods and a partial 4th brood of red-banded leaf rollers occur each year in midwestern orchards. Control measures should be started against the first brood although more generally injury to the fruit is caused by the late broods. The most effective insecticide for red-banded leaf roller control, these workers report, is TDE at the rate of 1½ lbs. of a 50% wettable powder per 100 gals. Parathion, 1½ lbs. of a 15% wettable powder per 100 gals., gives good control, but weathers rapidly and can not be relied upon over long periods. Other materials have shown promise and will be tested further. In 1950 late infestations of the leaf rollers were troublesome in that area, even though injury by the early brood was light. Orchards should, therefore, be watched carefully throughout the year for attack by this pest.

DDT at the rate of 2 lbs. of a 50% wettable powder per 100 gals., has continued to be the most effective insecticide for codling moth control in the midwest. Investigators point out than an equivalent degree of control can apparently be obtained with 1 lb. of EPN, 1½ lb. of 15% parathion, or 2 qt. of "Dilan" per 100 gal. Since EPN and parathion weather more rapidly than DDT, they can not be relied upon to provide adequate protection for long periods such as occur between the final spray in August and harvest.

Dieldrin, lindane, chlordane, aldrin, and benzene hexachloride, supplemented with DDT in the month before harvest, spray applied for oriental fruit moth control, and parathion, EPN, "Dilan," and methoxychlor, were all about equally effective in controlling the tarnished plant bug, stink bugs, plum curculio, and the oriental fruit moth on peaches. These materials were applied in 7 cover sprays beginning at full bloom, 6 of these applications being made at approximately 10 day intervals, and the 7th one month before harvest. Parathion was especially effective where large acreages were sprayed at that schedule. Mite infestations threatened except where EPN and parathion were used. These workers suggested 1½ lbs. of a 15% wettable powder to 100 gal. as a basic insecticide for peach spray schedules in that area, since this material will control the tarnished plant bug, the plum curculio, the oriental fruit moth, the red-banded leaf roller, scale insects, and mites, and seems to suppress stink bug activity as well as many of the other materials tested. To reduce poisoning of bees, they suggest that DDT be substituted for parathion if applications are made for controlling sucking bugs during the blossoming period.

Injury by the peach tree borer and the lesser peach tree borer was reduced by applying to the trunks and scaffold limbs 4 cover sprays of 15% parathion at 3 lbs. or 25% lindane at 2 to 3 pounds per 100 gallons.

Current Status of Pests

REPORTS from Oklahoma in late February and early March indicated that the greenbug situation remained critical in the wheat areas of the southcentral and southwestern parts of the State. Applications of parathion were made to control the bugs.

At the same time, a serious outbreak of army cutworms was reported infesting wheat in north Central Oklahoma, with indications that applications of toxaphene would be

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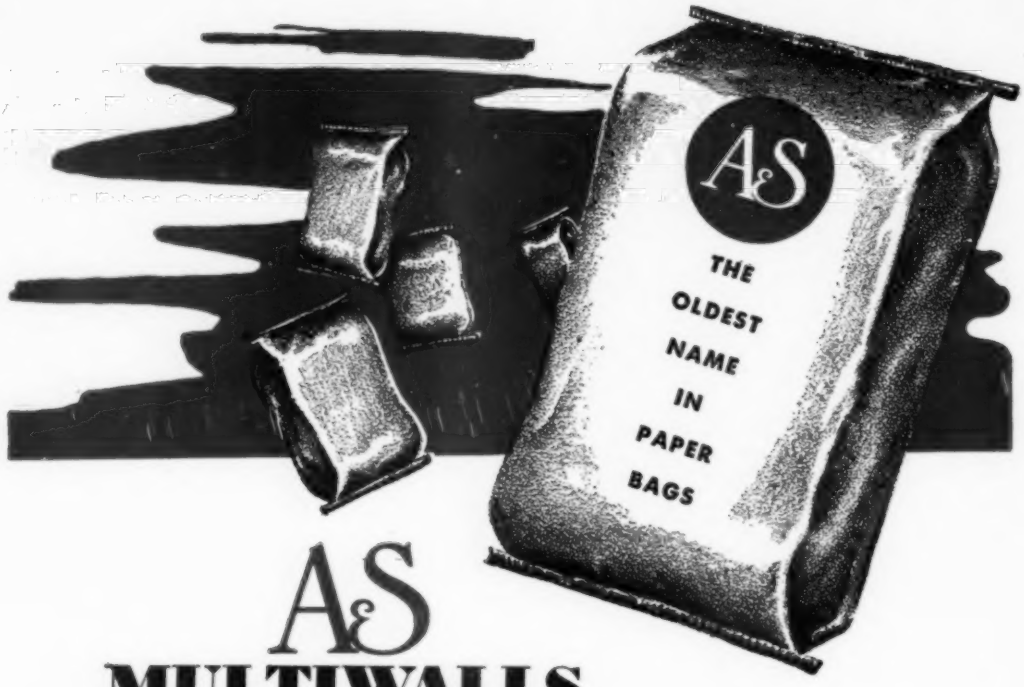

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Washington Report

THE possibility that food and fibre production for the 1951 season may fall considerably short of the nation's expanding needs under the defense program has once again emphasized the importance of pesticidal and fertilizer materials. A recently completed survey shows that farmers plan to plant only about 2% more land to crops this year than last. This, then, makes it extremely necessary that the highest possible yields per acre planted must be obtained in order to minimize the shortage as much as possible. Fertilizer and pesticide manufacturers and distributors would do well to carry out this theme in their sales and advertising programs for the coming season.

The survey which was conducted by the Department of Agriculture further pointed out that a possible shortage of labor at harvesting time and a reluctance to plow up lands which have been taken out of cultivation and put into grass in recent years appears to be holding down plans for crops expansion. The fear of labor shortage again emphasizes the necessity for judicious use of insecticides, fungicides and herbicides since all of these are excellent labor saving operations. It is expected that corn would fall short of requirements by about 5%, potatoes by about 15%, and an as yet undertermined amount of cotton. In the latter case, an estimate is not possible since the Department is barred by law from making cotton planting and production forecasts before July 1st. The cotton acreage it is hoped, however, will be 28,400,000 acres compared with 18,551,000 last year.

* * *

Unofficial Washington reports indicate that the Delaney Committee hearings will resume on April 12. First witnesses to be called will probably be representatives of the U. S. Department of Agriculture, none of whom were reached before suspension of the hearings.

Top defense officials were scheduled to appear before the House Agriculture committee, March 21, to discuss the important topic of just where agriculture stands in the defense production line-up. The meeting, called by Chairman Cooley, was to be attended by Defense Production Administrator William H. Harrison and National Production Administrator Manly Fleischmann. "The decision to call top defense officials before the Committee, Rep. Cooley said "was made as the result of the recent report of Representative Thomas G. Abernethy's Sub-Committee on fertilizer materials which pointed out that agriculture is being by-passed in the allocation of these materials."

* * *

As predicted here last month, the Senate Agriculture Committee is also moving into action to see that agriculture's needs for scarce and critical commodities are not slighted. Allen J. Ellender, Chairman of the Senate Committee on Agriculture and Forestry, on March 5, addressed a letter to Charles E. Wilson, Director Office of Defense Mobilization, in connection with the acute shortage of sulfur and sulfuric acid, with particular reference to agriculture's legitimate requirements. "Many agricultural interests", he reported to Mr. Wilson, "have the feeling that they are not receiving deserved recognition. . . . "The first step in recognizing farmers' needs", Sen. Ellender added, "probably should be the appointment of a well qualified agricultural authority to advise about the needs of agriculture in defense planning." In his reply, Mr. Wilson indicated that the appointment of such an agricultural authority is being taken under advisement.

The Chemicals Division of the National Production Authority has recently released the general allocations order for chemicals. The order itself is similar to the one of World War II, M-300, which does not in itself place any chemical under allocation but provides a means by which any chemical may be allocated when the need arises. As of the writing, it is expected that the first chemicals to go under allocations will be sulfuric acid, napthenic acid, chlorine and benzene. The sulfuric acid producers recently recommended that the acid, at least initially, be allocated only in the eleven far western states, which plan is likely to be adopted sometime before May 1st. It is thought further that chlorine and benzene will follow pretty promptly thereafter.

M-45 has three types of allocation control similar to the procedures of M-300 of War Production Board days. Appendix A materials require that both the purchaser and supplier will have to apply to NPA for specific authority to make deliveries and receive deliveries of the chemical. For Appendix B chemicals, the purchaser would not be required to apply to NPA, but would simply certify to the supplier the use to which the chemical would be put and the supplier, in turn, applies to NPA for approval.

Under Appendix C, for limited quantities of certain materials, the purchaser would certify the proposed use to the supplier who would in turn apply to NPA for the allocation. However, on large purchases, both the purchaser and supplier would apply directly to NPA. Of course, once a particular chemical has been placed under allocation, DO rated orders for that particular chemical would be completely superseded.

It will be recalled that during World War II, pesticidal chemicals subject to M-300 included pyrethrum, rotenone, DDT, copper sulphate and arsenic.

* * *

The shortage of sulfuric acid is due entirely to the decreasing supplies of sulfur available, as well as to the increased requirements for sulfuric acid in the manufacture of materials essential to both civilian activity and to the mobilization effort. As was previously indicated, there is a possibility that sulfuric acid, at least in the far western states, will be under allocation by May 1st. However, there are spotty shortages of sulfuric

A New Meaning for

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It's only natural that *safety* should become the watchword as chemicals have grown into their increasingly important role in agricultural pest control. They must be effective, of course, but now that's not enough.

Among insecticides, Du Pont methoxychlor gives a new and practical meaning to the concept of safety.

Du Pont methoxychlor is effective against major insect enemies of many kinds of crops and livestock, so it has a wide range of usefulness.

It does not burn or stunt plants, and can be safely used even on tender cucurbits, tomatoes and roses.

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On livestock, methoxychlor is effective against many kinds of flies and other insects, yet the chemical from sprays on the animals doesn't show up in milk, meat or fat.

Operators can apply it safely as methoxychlor presents no special hazards in dust or spray operations.

Methoxychlor insecticide is formulated by Du Pont in several different forms for ready use by farmers. As "Marlate" 50—fifty per cent technical methoxychlor wettable powder, it is ideal for spray or dust application to crops, and for large scale use on livestock. For use on dairy farms, it is prepared as Du Pont Dairy Cattle Spray and Du Pont Dairy Barn Insecticide.

These products are typical of the many Du Pont chemicals that are helping farmers do a safer and surer job of pest control.

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in other areas at this time also. NPA has taken care of many of these localized shortages on a 'spot' basis and will undoubtedly continue to do so.

Meanwhile, all efforts at conservation of sulfuric acid are in the works, and stringent efforts are again being made to make use of spent acid. It is well for producers of agricultural chemicals to make use wherever possible of spent acid materials and find outlets for their own spent acid.

* * *

Supplies of sulphur availabe for cotton insecticides are, of course, limited. The Production and Marketing Administration of the Department of Agriculture, to aid in bringing about the greatest possible conservation, has issued a release to all of their state and county personnel, bringing the sulphur storage to their attention. Wide publicity has been given to this release, both by various PMA offices, by industry associations and in particular, by the National Agricultural Chemicals Association.

The plea is made that sulfur should not be used as a diluent and should be included and used in cotton dusts only when it is absolutely necessary. It is hoped that it might be possible to save as much as 50,000 tons of sulphur by more careful and judicious use.

* * *

A meeting of the DDT Producers Industry Advisory Committee was scheduled to be held in Washington on March 21st, at which time there was to be a review of the DO orders then unfilled, a further exploration into the raw material shortage, and the effect that the shortage is having on the production of DDT, and the tremendously increased demand for DDT for export. It was not contemplated that there would be any increase demand for DDT for export. It was not contemplated that there would be any increase in the DO 'set-asides' which the industry would have to make, since it was felt that the 25% set aside would be adequate to take care of material needed directly in the defense effort. However, a serious problem was noted in the increased requirement of DDT for export and some of these requirements were considered of sufficient importance that perhaps directives might be issued to insure certain of the more important of these export requirements being filled. It was reasoned that a good many of these export requirements may be directly related to military assistance pact projects or perhaps of importance because of their being sponsored by the Economic Cooperation Administration. However, it is possible that a good many of the more urgent of these could be delayed until after the conclusion of the agricultural producing season here in the United States. This, then would make for a better distribution and would have little or no effect on the requirements for the domestic season.

* * *

There has been a reshuffling of the Office of Materials & Facilities, Production & Marketing Administration, U. S. Department of Agriculture, which is the claimant agency for fertilizers and pesticides for agriculture's use. L. B. Taylor, who had previously been Director of Office of Material & Facilities, has been appointed as head of Agricultural Conservation Programs Branch of PMA. His job has been taken over by Roy W. Lennartson who previously was Deputy Assistant Administrator for Marketing. As of this writing, pesticides are still within the Office of Materials & Facilities directly under W. R. Alstetter, Deputy Administrator for the Office of Materials & Facilities. Dr. Harold H. Shepherd continues as head of the pesticide section of this Office and is assisted by L. C. MacAllister, Jr., and John G. Fletcher. Dr. Mina R. Perlow has been added to the staff, working on special projects. She is now engaged in an evaluation of the facilities for the production of calcium arsenate and lead arsenate and the raw materials needed for their production.

* * *

Jonathan Garst of California has just been appointed special assistant to the Secretary of Agriculture, charged with the responsibility for seeing that there are adequate amounts of fertilizers and pesticides for agriculture's use. His interest is both long-term and short-term; he is interested in seeing that there are adequate amounts of facilities and materials made available for the coming season, and is also looking at the overall picture for the next several years. He is to make sure that there is sufficient amount of production facilities brought in to meet pesticide and fertilizer requirements as they arise for the next 5 to 10 years. Mr. Garst is well known for the work he did in connection with making fertilizer materials available immediately after World War II. In his new post he has no executive duties, and is concerned only with breaking bottlenecks so as to assure adequate supplies of needed materials and facilities.

* * *

A run-down of technical chemicals required for the pesticide season shows that in general there will be more adequate supplies available during coming season than there were last season. In the case of DDT, BHC, and calcium arsenate, production since October, 1, 1950 has greatly exceeded production in a comparable period beginning October 1, 1949. In fact, DDT production is perhaps 15% ahead, BHC between 15-20% ahead, and calcium arsenate probably 40% ahead of last year. DDT production is running in excess of 7 million pounds per month, BHC production is in excess of 6 million pounds per month, and calcium arsenate is in excess of 4 million pounds per month. However, the demand is much greater and Federal officials urge early buying of needed "insurance" supplies.

Parathion, 2,4-D and related herbicides, and the chlordane-aldrin-dieldrin compounds are not as freely available as had been expected. Toxaphene is running just about neck and neck with last year's availability. It had been anticipated that there would be greater increases in toxaphene this year due to the fact that an additional plant was being brought in by Hercules Powder Co. However, the chlorine situation has put a stop to that possibility, but it is expected that there will be as much material available as there was last year.

* * *

Recently the Office of International Trade placed DDT insecticides and BHC containing insecticides under positive export control as of March 20th. All DDT preparations containing 25% DDT or more and all BHC preparations containing 1% gamma isomer or more, must have a validated license before they can be exported. It is contemplated that

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High Concentrate Wettable
High Concentrate Dust Base
Solvent Concentrates
Emulsifiable Concentrates

BHC: Technical Grades
Finely Milled Dust Base Concentrates
Wettable Concentrate

NICOTINE: Alkaloid
Sulfate 40% (as alkaloid)

PARATHION: 15% and 25% Finely Milled, Wettable and Dust Base

LEAD ARSENATE: "Astringent," Standard and Basic

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Agricultural authorities and growers everywhere are hailing this sensational killer of weevils, fleahoppers and thrips as a long step forward in insect control.

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Aldrin is available under the brand names of leading insecticide manufacturers. Consult your local dealer and county agent.

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Wettable and Dry Powders
Oil Concentrates
Emulsifiable Concentrates

TOXAPHENE
Wettable Powders
Dust Concentrates
Emulsifiable Concentrates

CHLORDANE
Oil Concentrates
Wettable and Dry Powders
Emulsifiable Concentrates

BHC
Wettable Powders
Dust Concentrates

ROTENONE
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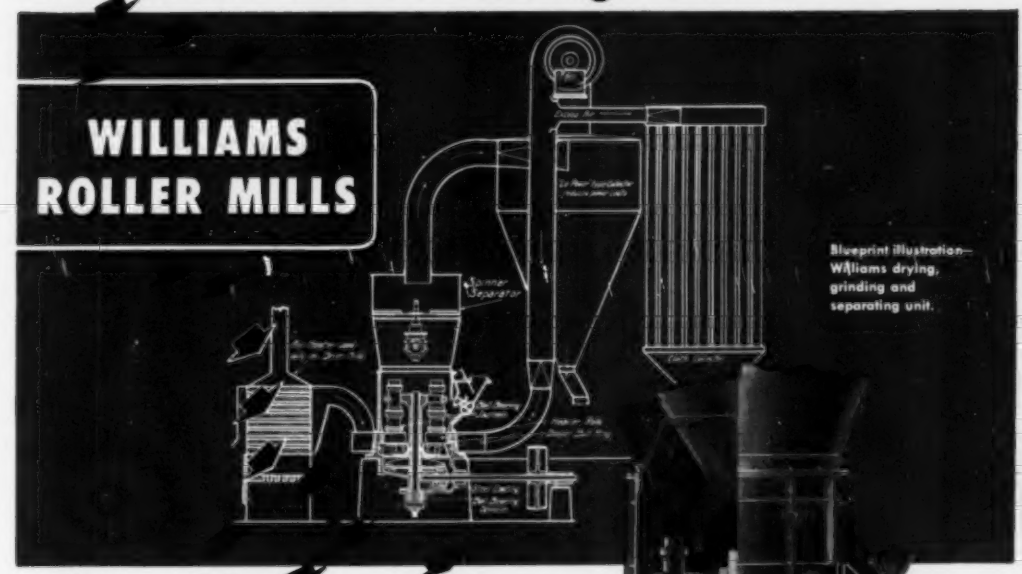

Blueprint illustration—Williams drying, grinding and separating unit.

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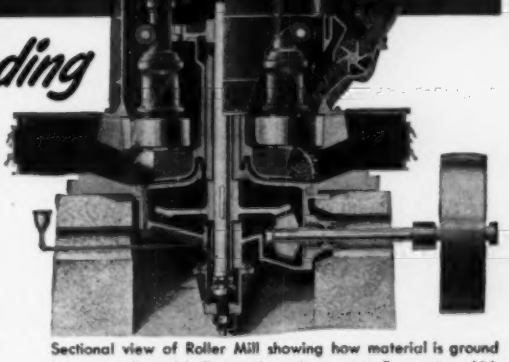

Sectional view of Roller Mill showing how material is ground between rolls and bull ring, then air swept to Separator which extracts fines and returns oversize for re-grinding.

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INDUSTRY NEWS

D. Lynch Joins Prentiss

David W. Lynch, well known throughout the insecticide, chemical

DAVID LYNCH

and drug fields, has joined the Chicago branch of the Prentiss Drug & Chemical Co., New York, as midwest sales manager, according to an announcement by A. W. Bevernick, vice-president. Mr. Lynch recently resigned as sales manager of the insecticide division of Velsicol Corp., Chicago, with which he had been associated for the past three years. Prior to that, he was with John Powell & Co., New York, for 13 years, latterly as vice-president. Mr. Lynch will make his headquarters at the Prentiss Chicago office, 9 South Clinton St., and will work directly under Mr. Bevernick.

•

Bushland Heads Branch

R. C. Bushland, USDA, Kerrville, Texas, was elected chairman of the Southwestern Branch of the American Association of Economic Entomologists at the meeting of the group in Dallas, Texas, March 1 & 2. Vice-chairman is Andrew Chapman, also of the USDA, Brownsville, Texas. Secretary-treasurer of the group is Sherman W. Clark, Texas Gulf Sulphur Co., Houston.

Some 229 persons from many sections of the U. S. were present at the Dallas meeting, according to a report from S. W. Clark, secretary-treasurer. These included Dr. Roy E. Campbell, Alhamba, Calif., president of the A.A.E.E.; and two past-presidents of the national organization, Drs. J. G. Sanders and S. W. Bilsing. Past presidents of the former Texas Entomological Society, out of which came the Southwestern Branch of the A.A.E.E., were also on hand. These included Dr. Bilsing, K. P. Ewing and Dr. E. W. Laake. The annual banquet the evening of March 2nd was attended by nearly 200 persons.

•

Clarkson to ARA Position

Dr. M. R. Clarkson, formerly chief of the Division of Inspection and Quarantine, Bureau of Animal Industry, U. S. Dept. of Agriculture, has been appointed to succeed the late Dr. S. A. Rohwer as Special Assistant for Defense Activities in the Agricultural Research Administration, the U. S. Department of Agriculture has announced. The appointment became effective Monday, March 26.

As chief of the Division of Inspection and Quarantine, Bureau of Animal Industry, Dr. Clarkson played a prominent part in the fight against hoof-and-mouth disease in Mexico.

The new appointee is a native of Ferndale, Washington, and holds degrees from Washington State College and Georgetown University.

•

More Ky. Fertilizer Used

An increase of more than 10,000 tons over the previous record for fertilizer consumption in Kentucky has been reported by the State Agricultural Experiment Station at Lexington. For the first time the tonnage of 6-8-6 was greater than that of any other grade. The 2-12-6 grade, formerly most used, declined 15 percent in 1950, the report says; whereas the 6-8-6 increased 61 percent over consumption of 1949.

Wert to Attaclay Sales

Attapulgus Clay Company, Philadelphia, has announced the as-

ROBERT WERT

signment of Robert W. Wert to sales and technical service activities in connection with "Attaclay," carrier and diluent product of the company. Mr. Wert, a native of Collingswood, N. J., was educated at Duke University, where he received his B.S. in organic chemistry in 1940. Following graduation, Mr. Wert spent four years in the U. S. Army Air Force, after which he joined Attapulgus as a chemist in the company's research laboratories. He will augment the Attaclay sales staff in taking up his new duties.

•

New Canadian Fert. Plants

Canada Packers, Ltd., Toronto, have announced the erection of two new fertilizer plants; one at Chatham, Ont., and the other at St. Foye, Que. The plants are of identical construction, each measuring 185 by 204 feet. An area 65 by 185 ft. at the front is devoted to storage of bagged goods, shipping offices, etc., and the remainder to bulk storage and manufacture. The storage section is constructed of steel frame with concrete block walls at the low levels, asbestos siding at higher vertical faces,

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and a concrete slab roof. The shipping section has a truss supported roof and brick-faced walls. The truss arrangement is said to allow unrestricted movement of the material inside the structure.

•

NFA June Meeting Planned

Program plans for the 26th annual June convention of the National Fertilizer Association were well under way at press time, although no announcement had yet been made regarding the roster of speakers. The meeting, to be held at the Greenbrier, White Sulphur Springs, West Virginia, is scheduled to begin June 11 and will continue through the 13th.

The NFA office, Washington, D. C., indicated that the complete program would probably be announced in May.

•

Delaware Firm Expands

Warren C. Newton, President of Newton Chemical & Supply Company, and also of O. A. Newton & Son Company, Bridgeville, Delaware, announces the expansion of operations and facilities of the former company.

The company is a distributor and formulator of agricultural chemicals in the Del-Mar-Va Penninsula.

•

Bemis Names Officers

At the recent annual stockholders' meeting of the Bemis Bro. Bag Co., held in St. Louis, the following persons were re-elected to serve as directors of the company for 1951: A. V. Phillips, H. H. Allen, F. M. Ewer, D. Belcher, C. F. Scott, F. G. Bemis, R. D. McAusland, P. E. Morrill, Judson Bemis, A. H. Clarke, H. V. Howes, G. H. Parsons and H. P. Claussen.

At the same time, the board of directors of the Bemis Bro. Bag Co. re-elected the following to serve as officers of the company for the coming year:

President, F. G. Bemis; vice-presidents, D. Belcher; P. E. Morrill; F. M. Ewer; H. H. Allen; H. V. Howes; H. P. Claussen; Judson Bemis; R. D. McAusland; A. H. Clarke; and C. W. Loomis. Treasurer, T. W. Little; secretary & asst. treas., R. Ramsay; and assistant secretary, D. M. Finley.

•

Retires From Cal-Spray

After almost 27 years with California Spray-Chemical Corporation, William B. Parker has retired to his ranch near Placerville. At the time of his retirement he was consulting entomologist in the Sacramento district office.

He began his employment with Cal-Spray in 1924 and before that time he was associated with the Bureau of Entomology, USDA for four years. Before this, he was farm adviser for the University of California extension service, having also received degrees from that school in 1910 and 1911.

His long career is marked by outstanding contributions in the field of pest control and specifically the hop flea beetle, hop aphis and the red spider as related to the Sacramento valley.

Succeeding Mr. Parker will be Dr. Donald Davis, a recent graduate of the University of California, who has been working with Mr. Parker in the Sacramento office.

•

MEETINGS

National Materials Handling Exposition, International Amphitheatre, Chicago, April 30-May 4.

National Fertilizer Association, Greenbrier Hotel, White Sulphur Springs, W. Va., June 11-13.

American Plant Food Council, The Homestead, Hot Springs, Va., June 14-17.

Pacific Slope Branch, A.A.E.E., Edmond Meany Hotel, Seattle, Washington, June 19-21.

12th International Congress of Pure and Applied Chemistry, New York City, September 10-13, 1951.

Combined meetings of American Association of Economic Entomologists; Entomological Society of America; American Phytopathological Society; and the Potato Association, Netherland Plaza Hotel, Cincinnati, Ohio, December 9-13.

11th Annual Meeting, Northwest Vegetable Insect Conference, Imperial Hotel, Portland, Oregon, January 21-23, 1952 (David H. Brannon, Pullman, Washington, Secty.)

Liquid Fertilizer Plant

Preparations for the production of liquid fertilizer by the Austrian Nitrogen Works, Vienna, have been reported. The materials would be made from liquid ammonia, it was stated.

Large-scale experiments are being conducted at present in co-operation with the Vienna Institute for Agriculture Cultivation, it is said. These will be continued through 1951 and, should they prove satisfactory, large-scale investments for commercial production of the fertilizer will be made in 1952.

The necessary machinery would have to be purchased abroad and the question of foreign exchange allocations for this purchase has not yet been clarified with the Austrian Finance Ministry. However, as the works (established in 1940-44 and one of the largest and most modern of its kind in Europe) are one of Austria's most important sources of foreign exchange, it is expected that the necessary funds will be made available.

•

Hercules SF Office Moves

Hercules Powder Co., Wilmington, Del., has announced that its San Francisco office is now located at the Standard Oil Building, 225 Bush Street. The office was formerly located on Montgomery Street. The office handles sales of Hercules products in the Bay region.

•

Expand Italian Sulfur

Italian sulfur mines in the north-central Adriatic Province of Pesaro, for some time past unable to operate on a competitive basis, are being reactivated to help meet the present world scarcity of sulfur. High prices in world markets make current production profitable and are also responsible for boosting output at Sicilian mines, according to the Italian Ministry of Industry at Rome. New sulfur explorations are also reported under way along the Adriatic Coast. Sharp reductions in U. S. exports due to stockpiling and rearmament demand have brought the present acute scarcity throughout Europe.

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Many at Alabama Pest Control Conference

A THREE-DAY plant pest control conference held on the Alabama Polytechnic Institute campus February 28 to March 2, drew a record attendance of 120, including state plant inspectors, aerial applicators, pesticide manufacturers and distributors, Flying Farmers, research and extension workers, and representatives of the state departments of aeronautics, agriculture, and public health.

Attending the conference were 40 representatives of 25 manufacturers, mixers, and distributors of pesticides. While most of the conferees were from Alabama, also represented were Georgia, Florida, Tennessee, Texas, North Carolina, Mississippi, Maryland, Delaware and Washington, D. C.

The conference was held by A. P. I. Agricultural Experiment Station. Participating agencies were the Alabama State Department of Aeronautics, Division of Plant Industry of the State Department of Agriculture and Industries, and the Alabama Flying Farmers' Association.

The first day's program was the 5th annual workshop for state plant inspector, while the last two days was the second annual short course for aerial applicators, and pesticide manufacturers and distributors.

Members of the conference were welcomed to the campus of Alabama Polytechnic Institute by Dr. Ralph B. Draughon, president.

"The most effective and economic controls of insects and diseases are dependent upon teamwork between research workers who develop control measures, manufacturers who produce the recommended chemicals and mixtures, and growers who apply the control measures as recommended," said Dr. E. V. Smith, dean and director, in speaking on the role of plant pest control in the agricultural program.

The conference was told by G. R. Williamson, Agricultural Sulfur and Chemical Company, Montgomery, Ala., that Alabama farmers will have available slightly less than half as much cotton insecticides for insect control on this year's crop as they applied in 1950.

W. F. Turner, entomologist, USDA Horticulture Laboratory, Fort Valley, Georgia, reviewed research progress with phony peach disease. Outlook for use of weedicides in agriculture was reported by Warren C. Shaw, USDA Division of Weed Investigation, Beltsville, Maryland. C. E. Fisher, superintendent of Substation No. 7, Spur, Texas, spoke on brush control research in that state. J. A. Noone, National Agricultural Chemicals Association, Washington, D. C., reviewed the proposed federal

(*Turn to Page* 103)

First photo. (L to R): Asa Roundtree, Alabama State Department of Aeronautics, Montgomery; Dr. E. V. Smith, dean of A. P. I. School of Agriculture and director of the Agricultural Experiment Station, Auburn; and G. R. Williamson, Agricultural Sulfur and Chemical Co., Montgomery.

Center photo. (L to R): Dr. Coyt Wilson, assistant dean of the A. P. I. School of Agriculture and assistant director of the Agricultural Experiment Station, Auburn; L. H. Smith, director, National Flying Farmers Foundation, Lafayette, Ala.; and Frank Stewart, commissioner, State Department of Agriculture and Industries, Montgomery.

Bottom Picture: During the plant pest control conference, aerial applicators perfected a state organizatoion to be known as the Alabama Aerial Applicators Association. They elected (L to R) James McAlister, manager of the Huntsville Air Service, vice-president; High W. Wheelliss, manager of the Dothan Aviation Company, president; and Asa Roundtree, secretary-treasurer.

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Fertilizer Industry Committee Meets

THE first meeting of the Fertilizer Industry Committee was held in Washington on March 9. L. B. Taylor and L. G. Porter were government chairman and vice-chairman respectively, with speakers including W. R. Allstetter of the Office of Materials and facilities, U.S.D.A.; Cedric G. Gran, of the Office of Price Stabilization; S. P. Wimpfen, Atomic Energy Commission; Carl R. Bullock of the Solicitor's Office; and J. G. McMullen of the National Production Authority.

It was pointed out at the meeting that the government anticipates making no fertilizer allocations unless sales become restricted to the point of making crop production problems critical. It was also stated that the fertilizer bag shortage is due largely to the Army's extensive take.

Fertilizer manufacturers can extend DO-97 priority for materials not to exceed in cost the total amount spent in 1950 for such items. The DO priority can be extended to an amount not to exceed $750 for the year to cover minor capital improvements without prior approval of the National Production Authority. This is in accordance with the MRO (Maintenance, Repair and Operating Supplies Order).

Any firm seeking to complete construction is urged to file a claim of needs with the NPA, and also to send a copy of the claim to L. B. Taylor, U. S. Dept. of Agriculture, who may be able to expedite the request.

Members of the Fertilizer Industry Advisory Committee are:

J. E. Barnes, U. S. Potash Company, New York, N. Y.; Richard E. Bennett, Farm Fertilizers, Inc., Omaha, Neb.; J. F. Doetsch, Chilean Nitrate Sales Corp., New York, N. Y.; Ralph B. Douglass, Smith-Douglass Co., Inc., Norfolk, Va.; E. H. Eno, G. L. F. Soil Building Service, Ithaca, N. Y.; B. B. Fall, The Rogers & Hubbard Co., Portland, Conn.; M. G. Field, Meridian Fertilizer Factory, Hattiesburg, Miss.; George W. Gage, Anderson Fertilizer Co., Inc., Anderson, S. C.; E. A. Geoghegan, The Southern Cotton Oil Co., New Orleans, La.; J. Ross Hanahan, Planters Fertilizer & Phosphate Co., Charleston, S. C.; Charles E. Heinrichs, Virginia-Carolina Chemical Corp., Richmond, Va.; Cecil A. Johnson, Agricultural Products Co., Webster City, Iowa; B. H. Jones, Sunland Industries, Inc., Fresno, Calif.; M. H. Lockwood, International Minerals & Chemicals Corp., Chicago, Ill.; Ray E. Neidig, Balfour-Guthrie & Co., Ltd., San Francisco, Calif.; J. Elam Nunnally, The Cotton Producers Association, Atlanta, Ga.; John R. Riley, Spencer Chemical Co., Kansas City, Mo.; Walter S Rupp, Baugh & Sons Company, Baltimore, Md.; John E. Sanford, Armour Fertilizer Works, Atlanta, Ga.; C. D. Shallenberger, Shreveport Fertilizer Works, Shreveport, La.; John W. Sims, The Farm Bureau Coop. Association, Inc., Columbus, Ohio; Mac C. Tyner, Oregon-Washington Fertilizer Co., Seattle, Wash.; Fred T. Techter, Allied Chemical & Dye Corporation, New York, N. Y.; James E. Totman, Summers Fertilizer Company, Baltimore, Md.; W. N. Watmough, Jr., Davison Chemical Company, Baltimore, Md.; Fred J. Woods, The Gulf Fertilizer Co., Tampa, Fla.

•

S. C. Fertilizer Tour

Clemson Agricultural College, Clemson, S. C., has issued an invitation to all fertilizer manufacturers, dealers and salesmen operating in South Carolina, to attend a tour of the South Carolina Truck Experiment Station, Summerville, S. C., on Wednesday, May 16, 1951. According to Dr. Bruce D. Cloaninger, head of the college's department of fertilizer inspection and analysis, a dutch barbeque dinner will be served at the Clemson Coast Experiment Station that day.

•

Freeport Leases New Dome

As a part of its effort to increase available sulfur supplies, Freeport Sulphur Co. has completed arrangements with the Texas Company for lease of a sulfur dome at Bay Ste. Eloine, La. Although the deposit is considered to be neither large nor rich, the company is reported to be planning on constructing a plant on the site. Arrangements have also been made by Freeport to lease four other domes believed to contain some sulphur which will be explored. These are known as Dog Lake, Lake Pelto, Venice and Garden Island Bay. Bay Ste. Elaine, Dog Lake and Lake Pelto are held by Texas under lease from Louisiana Land & Exploration Company. Venice is held by Gulf Oil Corporation. All of the properties are in swamp land and some are said to be under water.

•

William H. White Dies

WILLIAM H. WHITE

William H. White, USDA entomologist, an authority on the control of vegetable insects died of a heart attack March 14 in Washington, D. C. He had been leader of the Division of Truck Crop and Garden Insect Investigations in the Bureau of Entomology and Plant Quarantine since 1932.

Mr. White was well known in the U.S. and abroad as the director of research on the biology and control of insects that destroy or damage vegetables, sugar beets, garden crops, greenhouse plants, tobacco, mushrooms, and shrubbery. He was best known throughout the agricultural and food-processing fields for his refusal to recommend insect control by means of insecticides that might contaminate human foods. Federal recommendations were never made for use of chemicals in insect control that might result in contamination of vegetables intended for food.

Mr. White entered Federal service in the Department's Bureau of Entomology in 1914 as a Scientific Assistant, and was assigned to investigate insects that damage vegetables in greenhouses.

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USDA Approves Dieldrin

Dieldrin, the newest cotton insecticide approved for use in 1951 by the USDA in its Conference Report on Cotton Insect Research and Control, will be available in limited quantities for commercial use this summer according to its makers, Julius Hyman & Co., Denver, Colo.

The USDA conference report states: "Dieldrin was used experimentally for cotton insect control in many locations throughout the Cotton Belt in 1950. It was effective against the boll weevil when applied at the rate of 0.15 to 0.4 pound per acre. It was effective against thrips, the cotton fleahopper, the tarnished plant bug, the rapid plant bug, the fall armyworm, grasshoppers, and the variegated cutworm when applied at dosages of 0.05 to 0.15 pound per acre. It was not effective at low dosages for bollworm control, and DDT should be added when control of this insect is necessary. Dieldrin will kill newly hatched cotton leafworms at dosages effective against the boll weevil.

"Large-scale field experiments, small-scale field tests, and field and laboratory cage tests all indicate that Dieldrin is a highly effective insecticide for controlling many of the injurious cotton insects. It is effective either as a dust or a spray. . .Dieldrin is suggested for use in the control of cotton insects only where persons associated with its application and use are aware of the hazards involved and are supervised by individuals who are in a position to assume full responsibility and enforce the observance of precautionary measures prescribed by the manufacturers."

Aldrin, used extensively throughout the cotton belt last summer, is recommended by all states in the Cotton Belt this year. The supply of this chemical will be much greater for the 1951 season, the Hyman company has announced.

•

Krummrich, Monsanto, Dies

Funeral services were held March 2, for William G. Krummrich 56, vice president of Monsanto Chemical Company and general manager of the Organic Chemicals Division, who died February 27, in St. Louis. The deceased, a resident of Belleville, Ill., had been in ill health for the past year. He joined Monsanto in August, 1917, doing analytical work in the laboratory of the John F. Queeny Plant in St. Louis. He became production manager of the Organic Chemicals Division in 1943, was appointed general manager of that division in 1948, and was elected a vice president in December, 1949.

•

Union Bag Expands Plant

Union Bag and Paper Co. has announced a major expansion program for its plant at Savannah, Ga. When completed, the enlarged facilities will make possible an increase of the plant's daily production of kraft paper and kraft paperboard, by about 400 tons.

•

BEPQ Activities Changed

A re-organization of Bureau of Entomology and Plant Quarantine activities in northeastern States has been announced by the U. S. Department of Agriculture. The area affected by the present re-organization is that primarily covered by the Eastern Plant Board—the New England States, plus New York, Pennsylvania, New Jersey, Delaware, Maryland, Virginia and West Virginia. The Eastern Plant Board is an organization of State plant regulatory officials.

The purpose of the re-organization is to utilize more fully Bureau manpower, facilities, and equipment, and to coordinate all Bureau programs and administrative management in the region for reasons of efficiency and economy, according to Avery S. Hoyt, Bureau chief.

Headquarters for the newly established Northeastern Region will be at Greenfield, Mass., where the director of the region, his staff, and several operating units will be located.

Director for the Northeastern Region will be Roy G. Richmond, former leader of the Bureau's Division of Domestic Plant Quarantines. He will plan, direct, and coordinate all Bureau activities concerning the control and regulatory programs on gypsy and brown-tail moths, Japanese beetle, and golden nematode.

Immediate supervision of the gypsy and brown-tail moths control project remains under the leadership of J. M. Corliss, the golden nematode control project under Harry L. Smith, and the Japanese beetle control project under William Middleton.

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MCA Appoints Committee

A standing committee on chemicals in foods has been appointed by the Manufacturing Chemists' Association, the group has announced. This committee replaces the temporary task committee set up last year to prepare the Association's statement presented before the Delaney Congressional Committee investigating the use of chemicals in foods.

The new committee will concern itself with general industry and legislative problems connected with the safe use of chemicals in foods and will cooperate with government agencies and other organized groups interested in the subject. It will welcome communications and suggestions.

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Chase Personnel Change

H. J. Uldricks, formerly of the Chase Branch in Philadelphia has been appointed sales manager of the Memphis Sales office. He succeeds Harrison B. Rue, who has been appointed sales manager of the company's Buffalo, N.Y. office. R. J. Stevens has been appointed special representative of Chase Bag Company's Chicago General Sales Office, the company has announced.

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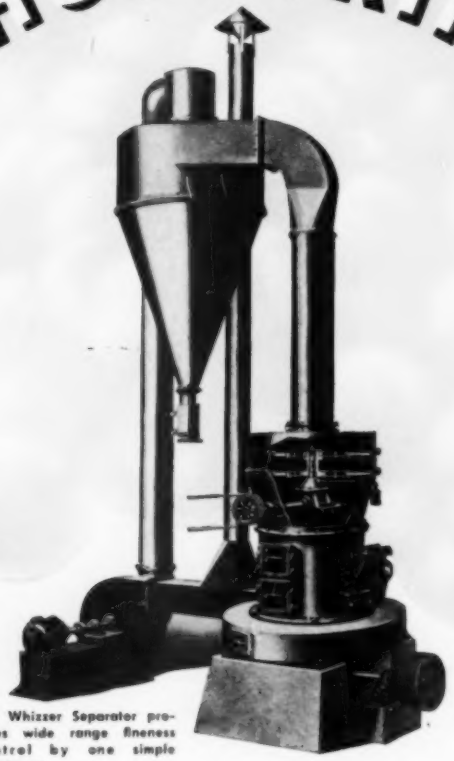
Bigger Fertilizer Storage

Curry Chemical Co., Scottsbluff, Nebraska, has recently built additional storage facilities for fertilizer materials. The plant, in its second year of operation, has doubled the sales volume of its first year, according to Bill Curry, president, who adds that the firm hopes to double this year's business in 1952.

SULPHUR GRINDING

A STANDARD OPERATION...

FOR RAYMOND ROLLER MILLS



The Whizzer Separator provides wide range fineness control by one simple adjustment.

Specially equipped Raymond Roller Mills have long been considered the standard unit of equipment for the fine grinding of sulfur.

Among the necessary Mill features required for this exacting operation are ball bearing oil journals especially designed for this work. Inert gas blankets the entire Mill System.

Electrically welded piping and pipe flanges, and double bronze rotary valves for discharging the material, make the system practically gas-tight, and keep air infiltration to an absolute minimum. In addition, the piping and cyclone collector are built of extra heavy gauge sheet steel, and the system is furnished with pressure relief vents.

The slow speed of the grinding elements eliminates any possibility of the sulfur overheating and sticking. The Mill System is entirely clean, dustless and automatic in operation.

Raymond Roller Mills also do an outstanding job on insecticide dust formulations. For further details of this economical method of production, write for Raymond Roller Mill Catalog.

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Raymond PULVERIZER DIVISION

American Mosquito Ass'n Meets in Chicago

THE American Mosquito Control Association, at its Chicago convention in March, heard a plea for an educational campaign to offset widespread misinformation about insecticides and to establish the sound benefits which their use brings.

Speaking on the topic, "Insecticide Hazards—Facts and Fallacies," Dr. F. C. Bishopp, assistant chief, USDA Bureau of Entomology and Plant Quarantine, declared that the great need now is for such an informational drive, rather than for new laws to curb the use of insecticides.

Asking, "Is there need for more legislation?" Dr. Bishopp asserted that laws already exist sufficient to care for most needs. More effective control of custom applicators is needed, however, but this, he thought, could best be handled through state statutes. In the interest of safety, label laws should also be enacted in states where they are now lacking, he said.

Much of the public alarm over use of insecticides, Dr. Bishopp asserted, has arisen from isolated instances where they have been carelessly or improperly used by inexperienced persons. By energetic publicity, emphasizing the great benefits which insecticides bring to public health and economic welfare, the movement to restrict use of these essential chemicals could be counteracted, he maintained. The Mosquito Control Association could well take a large part in such an educational effort, he suggested.

In a resolution approved later during the 3-day convention, the Mosquito Control Association called attention to the vital importance of insect control for protection of health and welfare and referred to "certain national legislation now being considered that may affect the availability of pesticides for control of disease-carrying insects and destroyers of food and fiber."

Continuing, the resolution urged that "full consideration be given to the great good done through use of insecticides and the importance of taking no step that will interfere with development, production and safe use of pesticides, so necessary for our defense effort."

In a second resolution, also unanimously adopted, the Association called attention to the success attending a United Nations agency's efforts to wipe out malaria and other insect-borne diseases in foreign lands and in the United States and also referred to measures for control of pests of livestock and crops, so vital to this country's defense.

Since the continuance of these two programs is dependent on the availability of DDT and other insecticides, the resolution then urged that "authorities concerned with the allocation of chemicals and containers required for manufacture and distribution of insecticides, should see that adequate supplies are made available to meet these vital needs."

For president of the American Mosquito Association for 1951 the convention selected Dr. Don M. Rees, professor of zoology at the Univ. of Utah, Salt Lake City, Utah. Vice-president is Dr. Cecil R. Twinn, of the Canadian Dept. of Agriculture, Ottawa, Ontario. For treasurer, R. E. Dorer, state director of malaria control, Norfolk, Va., was chosen, while Thos. D. Mulhern, state dept. of public health, Fresno, Calif., will continue as executive secretary.

Pyrethrum, Allethrin Supply Studied

PYRETHRUM products will continue to be in scarce supply through 1951 and well into 1952, according to J. Alvin Smith, president of John Powell & Co., New York. Two factors most important in this belief are, (1) an ever widening demand for safety in insecticides and the recent emphasis placed on this phase of insecticide marketing by investigations and hearings. This has thrown a heavy load on demand at a time when supplies are short; (2) changes in the insecticide industry and the development of new uses of pyrethrum-synergist compounds which will expand the basic demand for pyrethrum.

Shortages of pyrethrum products have accelerated expansion in allethrin output. Present manufacturers include Carbide and Carbon Chemical Corp., New York; U. S. Industrial Chemicals, Inc., New York; and Benzol Products Co., Newark, N. J. The latter company, for which McLaughlin Gormley King Co., Minneapolis, are sole sales agents on allethrin, has already doubled its initial output at the beginning of 1951.

A recent estimate by George McLaughlin, president of McLaughlin Gormley King Co. showed that by February, 1952, production of allethrin in the United States will not be sufficient to take care of all demands for this product in the manufacture of household insect sprays, grain and mill sprays, and aerosol insecticides.

At the present time, straight pyrethrum concentrates are obtainable only in very restricted quantities and at prices ranging from $12 to $15 per pound of 20 per cent pyrethrins. Supplies of pyrethrum-synergist combinations are more freely available at prices under these figures.

Not too much hope can be held out for shipments of pyrethrum from Japan to augment present imports from Kenya and the Belgian Congo, according to Mr. Smith. Thus far, imports from Japan have been very limited, and the quality has not been of the best. Japanese pyrethrum extracts are more freely available for import into the United States, but are held at high prices due to the heavy demand in Asia.

The U. S. Government has a stockpile of pyrethrum estimated at approximately 300,000 pounds basis 20 per cent pyrethrins as extract. The original cost was estimated at two million dollars, while its market value today is close to double this figure. Whether any of this pyre-

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(DDT)
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(BHC)

The national need for increased production points to a greatly expanded use of all agricultural insecticides and herbicides. This can mean much larger profits for you—if you have the stock on hand to supply your customers' needs promptly and fully. We will do everything humanly possible to see that you do have these supplies, even though there is a serious shortage of many basic chemicals. However, our ability to serve you depends upon our knowledge of your future needs. For that reason, we urge you to place your orders as far in advance as possible.

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Hyman Advances Chemists

Announcement has been made by Julius Hyman & Company, manufacturer of aldrin and dieldrin,

MR. BLUESTONE DR. LIDOV

Denver, Colorado, of the promotion of Dr. Rex E. Lidov to the position of director of research. Henry Bluestone, who joined the company in 1947, has been named assistant director of research, filling the position which Dr. Lidov has held since the company was organized in 1946. Both men are graduates of the University of Chicago.

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Hercules Ext. Complete

Hercules Powder Co., Wilmington, has announced the completion of a three-story addition to the main laboratory building at its Experiment station near Wilmington. The company stated that the addition provides 26 new laboratory units accommodating 51 chemists and increases the research facilities of the main building by more than 60 percent.

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Tulsa Fertilizer Plant

A wholesale and retail distribution plant for rock phosphate has been installed at Tulsa, Oklahoma, by Tulsa Fertilizer Service, Inc. The distribution plant includes two 40-ft. silos with a storage capacity of 500 tons; a warehouse 20 by 60 feet, having a storage capacity for bagged material of some 200 tons, and large scales for trucks.

The company will wholesale the bulk rock phosphate to all vendors with spreading equipment, for servicing large areas within an approximate 50 to 60-mile radius of Tulsa. Bagged material will be available to growers of the area.

Operations of the new company will be managed by Fertilizer, Inc., of which D. C. Wray is president and director. Secretary-treasurer of the firm is Letitia Dabney.

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Vt. Fertilizer Conference

A one-day conference for representatives of the fertilizer industry was scheduled to be held April 2, at the Vermont State Agricultural College, Burlington. Fieldmen from the milk and grain industries were also invited to attend. R. P. Davison, extension county agent leader, was to be chairman of the meeting.

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Spencer Expands Output

Kenneth A. Spencer, president, has announced that the board of directors of Spencer Chemical Company has approved a further expansion of the company's anhydrous ammonia and nitric acid production facilities at its Jayhawk Works near Pittsburg, Kansas.

The production of these essential materials has already been increased by substantial additions to the Jayhawk Works, by the purchase of the ammonia plant at Henderson, Kentucky, and the leasing of nitric acid facilities at Charlestown, Ind.

•

Pennsalt Names Siddall

Cameron Siddall has been named assistant sales manager for agricultural chemicals for the 11 western states, by Pennsylvania Salt Mfg. Co., Philadelphia. Mr. Siddall will make his headquarters in the Woolsey Building, Berkeley, Calif.

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Crouse to J. M. Huber

Kenneth C. Crouse has been appointed administrative assistant to R. H. Eagles, vice-president of the industrial products department of J. W. Huber Corporation, it was announced by the company recently. Mr. Crouse will supervise the department's statistical sales records and will be in charge of its advertising and publicity.

J. W. Brooks Joins CSC

Dr. James W. Brooks has joined the agricultural chemicals division of Commercial Solvents Corpora-

JAMES W. BROOKS

tion in charge of feed, insecticide, and fertilizer sales in the central states, it has been announced by Daniel B. Curll, Jr., manager of the division. Dr. Brooks will make his headquarters at the Terre Haute office of the company.

Before joining C.S.C., Dr. Brooks was manager of the agricultural chemicals division of N. S. Koos & Son Co. He has had extensive sales and research experience in the feed, insecticde, and fertilizer fields, including state experiment station work. During the war, Dr. Brooks was in charge of a malaria unit of the Sanitary Corps in the Pacific. A graduate of the University of Wisconsin with a Ph.D. in economic entomology, Dr. Brooks is the author of more than a dozen papers, principally on the subject of chemical control of insects.

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Cotton Pest Proceedings

Proceedings of the fourth annual cotton insect control conference held at Memphis, Tenn. in December, have been assembled and printed in a 58-page booklet, by the National Cotton Council of America, Memphis. Talks made by various speakers at the conference are presented in the booklet, with pictures of each speaker. Among these were Ernest Hart, president of the Na-

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tional Agricultural Chemicals Association; Dr. F. C. Bishopp, Dr. H. L. Haller, and L. F. Curl, USDA; and Harold A. Young, president; M. K. Horne, Jr., chief economist; and Claude L. Welch, director, of the National Cotton Council of America.

•

Gen. Holly Joins FMC Corp.

Food Machinery and Chemical Corporation has announced the appointment of Brigadier General Joseph A. Holly, U.S. Army Retired, as executive assistant to the management of FMC's newly established ordinance division at San Jose, California. This division was created recently by FMC when the corporation was awarded an army ordnance contract to produce a substantial number of new type vehicles.

Gen. Holly served with the armed forces since his graduation from the U.S. Military Academy in 1918, until his recent retirement. His various assignments have taken him to Europe, the Philippines, and Alaska. His numerous decorations include the Legion of Merit with two Bronze Oak-Leaf Clusters, the Bronze Star Medal, the Most Excellent Order of the British Empire from Great Britain, and the Croix de Guerre with Palm from France.

"Fertilizer Situation" Compares Tonnages

UNDER the title of "The Fertilizer Situation for 1950-51", the U. S. Department of Agriculture, Production and Marketing Administration has issued the eighth in a series of reports on the annual supplies of fertilizer. The report was prepared by L. G. Porter and T. H. Tremearne, of the Office of Materials and facilities, PMA, under L. B. Taylor, director of the office.

The 1950-51 Outlook

For the 12 months ending June 30, 1951, the supply of nitrogen and potash for fertilizer purposes should exceed all previous records. However, the supply of superphosphates in 1950-51 will be less than in 1949-50.

Nitrogen (N) During 1950-51, the quantity of nitrogenous fertilizer in all forms expected to be available for use by farmers is placed at approximately 1,250,000 tons nitrogen (N) content basis as compared with the available supply of approximately 1,030,000 tons in 1949-50 and of 1,005,000 tons in 1948-49.

The 1950-51 estimate assumes that imports will be slightly higher than in 1949-50 and that commercial exports will be lower.

Phosphates (P_2O_5) Production of available phosphoric acid in normal and concentrated superphosphates and wet base goods for the fiscal year ending June 30, 1951 will total approximately 1,803,000 tons, somewhat less than the output of the previous year.

It is assumed that production of miscellaneous forms of phosphatic fertilizers, such as calcium metaphosphate and phosphoric acid used for fertilizer as such, will be about the same as in 1949-50. Imports and exports of processed phosphatic fertilizer are not large in relation to total production.

Taking these factors into consideration, it is estimated that the aggregate domestic supply of phosphatic fertilizers in all forms and from all sources—including net imports—for 1950-51 will comprise some 1,921,000 tons P_2O_5 basis as compared with about 2,060,000 tons in 1949-50 and 1,910,000 tons in 1948-49. Some revisions and adjustments have been made for the 1949-50 and 1948-49 on the basis of the more complete information now available.

Potash (K_2O). Based on a continuing high level of production during the remainder of 1950-51 (potash fiscal) year, it is estimated that domestic deliveries of potash, plus imports, will reach approximately 1,300,000 tons, K_2O content. This compares with the deliveries of 1,125,000 tons in 1949-50 and 1,070,000 tons in 1948-49.

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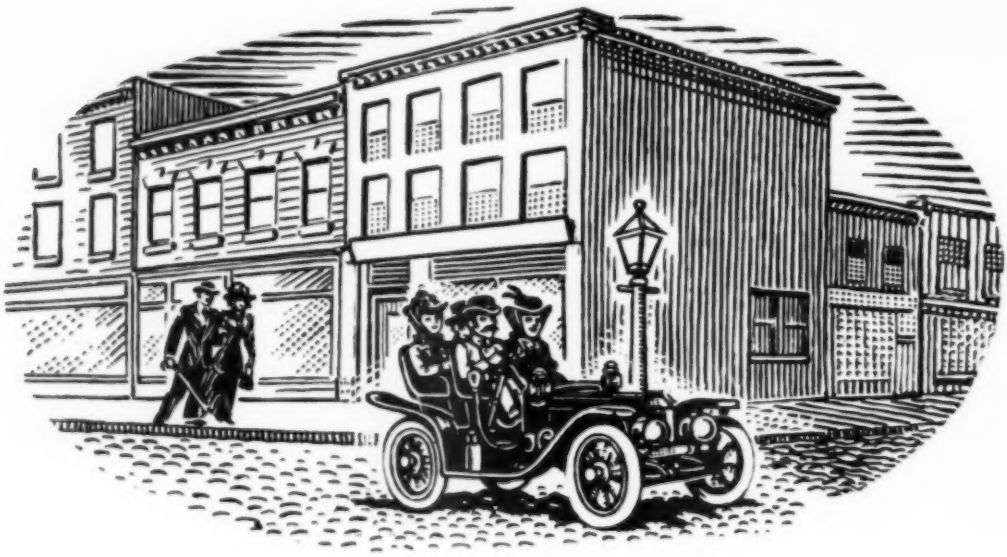
Lion Dividend Announced

At a meeting on March 13, directors of Lion Oil Company declared a regular quarterly dividend of fifty cents per share on the common stock of that company to be paid April 16, 1951, to common stockholders of record at the close of business March 30, 1951.

Kolker opens new BHC & DDT plant in Texas

Kolker Chemical Works, Inc., Newark, N. J., have announced completion of a new DDT unit at their Houston, Texas plant. This is said to be the first DDT-producing plant in the southwest. The firm located at Houston because raw materials are produced in the area, and finished products can be easily distributed from there. Kolker also has a BHC plant in operation in Houston. (See front cover)



THERE'S BEEN SOME CHANGES MADE...

When the 'duster' and the hand-crank were standard equipment for those new fangled horseless carriages, the science of Agricultural Chemical Application was virtually unknown.

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N. Central Branch, AAEE, To Toledo

A COMPLETE two-day program was planned for the sixth annual conference of the North Central States Branch of the American Association of Economic Entomologists, March 21 and 22, at the Commodore Perry Hotel, Toledo, Ohio. The advance program called for talks by representatives of the U. S. Department of Agriculture, the American Medical Association; State Agricultural Experiment Stations and the industry. The annual banquet was scheduled for Wednesday evening, with C. R. Neiswander as toastmaster. An address by Louis A. Wolfanger was to feature the after-dinner program.

A talk by Dr. Roy E. Campbell, president of the A.A.E.E. was scheduled for the opening morning session, in connection with a business meeting at which new officers were to be elected.

Bernard D. Levinson, presiding officer at the recently-completed Food and Drug Administration Hearing on toxic residues was to review the hearing, and Dr. F. C. Bishopp, assistant chief, Bureau of Entomology and Plant Quarantine, the Delaney Committee activities. Work of the AMA Committee on Economic Poisons was to be reported by Dr. Bernard E. Conley, Chicago.

A progress report on the use of systemic insecticides was to be made by Dr. Floyd F. Smith; and their advantages, limitations and future were to be discussed by F. Ray Barron, Jr. and Fred W. Fletcher. This was to complete the activities of the morning.

Wednesday afternoon was to be devoted to the presentation of of technical papers in three concurrent sessions, with T. C. Allen acting as chairman and J. P. Sleesman, secretary of the first, on vegetable insects; Roger C. Smith and R. J. Dicke leading the second section, on stored products and household insects; and Ray Hutson and C. R. Cutright heading the third section, covering fruit insects.

Evening sessions were to continue, covering extension entomology, under the leadership of G. A. Lehker and H. B. Petty; apiculture and pollinating insects, under B. E. Montgomery and R. T. Everly; and insect physiology and toxicology, under Carl J. Weinman and Frank W. Fisk.

A series of papers on cereal and forage crop insects was on the program for Thursday morning, with J. A. Munro and C. R. Weaver in charge. With this section were two other concurrent programs: "Insects Affecting Man and Animals," under the leadership of W. N. Bruce and B. F. Quinsenberry; and "Forest and Shade Tree Insects" with S. A. Graham and G. W. Thomas in charge.

Corn Borer Discussed

CONTROL of corn borer was on the agenda for Thursday morning, in a session led by T. A. Brindley and E. T. Hibbs. Frank Irons, USDA, was to describe high-clearance, self-propelled sprayers for borer control, and subsequent technical papers were to be presented by Dr. Brindley, W. G. Bradley, F. F. Dicke, E. W. Beck, H. O. Deay, E. L. Chambers, and R. L. Bowles. J. J. Davis, Purdue University, LaFayette, Ind., was to terminate the session with a paper on "The Trend of Future Research on the Corn Borer."

"Insecticides and General Control Problems" is the title of another section running concurrently with the one on corn borer. Heading this section was Roscoe E. Hill and R. H. Davidson, according to the advance program. To appear on this portion of the program were J. E. Fahey, W. E. McCauley, C. W. Kearns, G. E. Marshall and George C. Decker. The third concurrent section of Thursday afternoon, was to be the one on greenhouse insects, under the leadership of L. L. English and R. B. Neiswander.

Officers of the North Central States Branch are C. R. Neiswander, president; C. J. Weiman, vice-president; and J. W. Apple, secretary-treasurer. In charge of the program was a committee composed of R. K. Chapman, chairman; H. O. Deay and C. R. Cutright.

Sulfur Scarcity

To emphasize the current scarcity of sulfur and the crying need for supplies in some directions, a recent spot offer of 700 tons to one of the world's largest paper manufacturers has come to light. The basic producers' price for sulfur is around $22 per ton. Price for the 700 tons? A mere $150 per ton. Asked what he did when the chemical dealer offering the stuff mentioned this price, the paper company purchasing agent said: "I bought it!"

APFC Plans '51 Convention

The American Plant Food Council's convention program committee is "well along" in the process of selecting speakers for the group's annual summer convention scheduled to be held at the Homestead Hotel, Hot Springs, Va., June 14-16. No announcement of the program had been made at press time, but a spokesman for the Council indicated that the complete program would be announced early in May.

Chairman of the APFC program committee is W. T. Wright, .F S. Royster Guano Co., Norfolk, Va. Other members are: Paul Speer, U. S. Potash Co., New York; Joseph A. Howell, president, Virginia-Carolina Chemical Corp., Richmond, Va.; A. F. Reed, Lion Oil Co., El Dorado, Ark.; and John V. Collis, Federal Chemical Co., Louisville, Ky.

Kansas Hort. Report

Kansas State Horticultutal Society has issued its biennial report for 1950, recording the transactions of the annual meetings and a summary of horticultural statistics for 1948 and 1949. Officers of the Society are: C. W. Ryan, Wathena, Kans., president; W. G. Amstein, Manhattan vice-president; Frank Clark, Coffeyville, treasurer; and H. L. Drake, Bethel, secretary. Entomologists for the group are Drs. Roger C. Smith and Chas. D. Michener.

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ORTHO Lindane*

*Approved name for the "pure Gamma isomer" of Benzene Hexachloride, a most versatile insecticide.

Effective Multi-Purpose Uses of ORTHO Lindane:

For farming and ranching — Controls flies and other insects in dairy barns — external animal parasites — mange mites, lice and ticks on sheep, cattle, hogs and horses — scab and sarcoptic mange.

For crop pest control — *ORTHO* Lindane is being widely used in control of many crop pests and with unprecedented success for the control of wireworms and other soil insects by seed treatment—also controls food and grain storage insect pests.

For household pests — Kills insects three ways; by contact, vapor action and stomach poisoning. Effective control of flies, mosquitoes, lice, roaches, silverfish, bed bugs, ants, clothes moths, carpet beetles, spiders, etc. *ORTHO* Lindane in combination with DDT, Pentachlorophenol, other chlorophenols and petroleum oils gives effective termite control.

Check These ORTHO Lindane Advantages:

High Safety Factor — Approved by the USDA for lice and mange control on dairy cattle. Shows no contamination in milk when properly applied. Kills poultry insects by contact and does not taint eggs or meat when properly applied. Even used by dermatologists for human itch, lice and scabies. Not cumulative and practically odorless. Any taken in by a warm-blooded animal is eliminated.

Small Amounts Needed for Good Control — Only 1 to 2 lbs of *ORTHO* Lindane required, where up to 20 lbs. of DDT or Methoxychlor would be necessary.

The Story of ORTHO Lindane

This product was developed after years of *ORTHO* research. After its discovery, the makers of *ORTHO* products made hundreds of tests with "pure Gamma isomer" formulae. In July, 1949, the United States Department of Agriculture approved and named the 99% "pure Gamma isomer" Lindane. The name Lindane cannot be used for material not meeting all the properties specified for this chemical. Anyone who claims his product contains Lindane must see that it meets these very high purity standards. The name Lindane cannot be applied to low purity BHC. *ORTHO* Lindane in technical form (99%) is available from California Spray-Chemical Corporation. It is a white, granular, free-flowing material easily handled and readily subject to wettable powder, dust, and liquid formulations.

Specify ORTHO Lindane

Write for free informative booklet containing full information and technical data on the many uses of *ORTHO* Lindane. Address a card or letter to: California Spray-Chemical Corp., P.O. Box 129, Maryland Heights (St. Louis) Missouri.

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V-C fibers

Vicara® Textile Fibers
Zycon Fibers

V-C bags

Burlap Bags Cotton Bags
Paper Bags

V-C chemicals

Phosphoric Acids
Phosphorus
Calcium Phosphates
Disodium Phosphate
Trisodium Phosphate
Tetrasodium Pyrophosphate
Sodium Tripolyphosphate
Sodium Metasilicate
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Black Leaf 40—for spraying fruits, vegetables and flowers, to control aphids and similar sucking insects. Also used to control certain external parasites of cattle, sheep, and poultry—and as a drench for sheep.

Black Leaf Dry Concentrate—a dry powdered nicotine compound that combines the versatility of Black Leaf 40 with the convenience of a dry product.

Black Leaf 155—a "fixed" nicotine compound for spraying apples and pears to control codling moth, also for controlling grape berry moth and citrus thrips.

Black Leaf 10 Dust Base—a "free" nicotine compound, easy to mix with non-alkaline carriers to make a neutral dust.

Black Leaf Garden Dust—a multi-purpose dust or spray containing nicotine, pyrethrum and rotenone—*plus* a concentrated fungicide.

Black Leaf Rotenone Dust—1% rotenone and sulphur, blended on our special carrier material.

Black Leaf Mash-Nic—for controlling the large roundworm (*Ascaridia galli*) in chickens. A "single-shot" treatment.

Nico-Fume Liquid—contains 40% actual nicotine in a "free" form—for greenhouse spraying and fumigating to control aphids and similar sucking insects.

Nico-Fume Pressure-Fumigator—spreads penetrating nicotine fumes under pressure to control aphids and similar sucking insects in the greenhouse.

Benzo-Fume Pressure-Fumigator—for the control of greenhouse red spider mites.

Black Leaf Aerosol Insect Killer—a highly effective aerosol insecticide containing a combination of pyrethrins and piperonyl butoxide. Controls flies, mosquitoes, ants, roaches and similar household insect pests.

Black Leaf 3-5-40 Cotton Dust • Black Leaf 3-5-0 Cotton Dust
Black Leaf Toxaphene-Sulphur Dust • Black Leaf Toxaphene Dust
—for control of boll weevils, aphids, fleahoppers, thrips, boll worms, and certain other insects infesting cotton.

Other cotton insecticide materials available.

"Black Leaf"®

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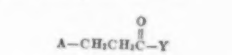
Richmond, Virginia • San Francisco, California

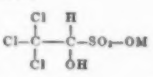
Industry Patents

2,535,877. Plant Growth Regulants. Patent issued December 26, 1950 to William D. Stewart, Yonkers, N. Y., assignor to The B. F. Goodrich Company, New York. In the art of altering the growth characteristics of plants by a method which comprises bringing at least a portion of the plant structure into contact with a plant growth regulant and then maintaining the plant structure under conditions normally favoring growth, the improvement which consists in utilizing as the plant growth regulant a composition containing as the essential active ingredient 0.01% to 5% by weight of a compound having the formula



where A is the residue derived from a dithio acid by the removal of the hydrogen atom of the SH group of said acid and where Y is a substituent selected from the class consisting of the hydroxyl radical, an oxy-hydrocarbon radical, the amido radical, a hydrocarbon substituted amido radical, and oxyammonium and oxymetallic groups, intimately admixed with an inert diluent.

2,536,751. Herbicidal Compositions. Patent issued January 2, 1951 to Jonas Kamlet, New York, N. Y., assignor to Pittsburgh Coke & Chemical Company, Pittsburgh, Pa. A herbicidal composition comprising a solution of a salt of the general formula



wherein M represents a cation and a surface-active agent dissolved in water.

2,536,858. Insecticidal Composition Comprising 3-Cyano-1,4-Endomethylene-cyclohexane-5. Patent issued January 2, 1951 to Miller W. Swaney and Samuel B. Lippincott, Westfield, N. J., assignors to Standard Oil Development Company. An insecticidal composition comprising 3-cyano-1,4-endomethylene-cyclohexene - 5 as the active ingredient admixed with a surface active dispersing agent which lowers the surface tension of water and thereby promotes aqueous colloidal emulsions of the 3-cyano-1,4-endomethylene-cyclohexene-5.

2,537,608. Selective Crab Grass Herbicidal Compositions. Patent issued January 9, 1951 to Miller W. Swaney and Howard L. Yowell, Westfield, and John F. McKay, Jr., Cranford, N. J., assignors to Standard Oil Development Company. A selective crab grass herbicide concentrate solution composition comprising a solution of phenyl mercuric acetate in an aromatic extract of kerosene, said aromatic extract boiling in the range of 325°-600° F. and having an aromatic content of between 83% and 98%.

A selective crab grass herbicide composition comprising a solution of phenyl mercuric acetate in a sulfuric acid-treated kerosene, said acid-treated kerosene having a specific gravity in the range of 0.775-0.825, a boiling point predominantly in the range of 400°-505° F., and being substantially free of aromatics.

2,537,690. Fungicidal Treatment. Patent issued January 9, 1951 to David T. Mowry, Dayton, Ohio, and Norman R. Piesbergen, Collinsville, Ill., assignors to Monsanto Chemical Corp., St. Louis, Mo. A method of retarding fungus growth on citrus fruit, which comprises contacting the fruit with allyl carbanilate.

2,537,691. Fungicidal Treatment. Patent issued January 9, 1951 to David T. Mowry, Dayton, Ohio and Richard R. Morner, Dayton, Ohio, assignors to Monsanto Chemical Corp., St. Louis, Mo. A method of retarding fungus growth on citrus fruit, which comprises contacting the fruit with an ester of the group consisting of alkyl carbonilates and oxaalkyl carbanilates, wherein the alkyl and oxaalkyl radicals have an atom chain of from three to eight carbon and oxygen atoms beginning with the carbon atom adjacent the ester linkage.

2,537,995. Herbicides, Patent issued January 16, 1951 to Horace E. Hall, Nashville, Tenn., assignor to Tennessee Products Corporation, Nashville, Tenn. A method for the control of weeds which comprises the application of the reaction product of substantially equimolecular proportions of furfural and sodium bisulfite to the weeds and the ground upon which they are growing.

2,538,513. Composition for Control of Mite and Insect Pests. Patent issued January 16, 1951 to Eugene E. Kenaga, Midland, Mich., assignor to The Dow Chemical Company, Midland, Mich. A composition for the control of mite and insect pests, comprising as active toxic ingredients (1) the 4-chlorophenyl ester of 4-chlorobenzene sulfonic acids and (2) 1,2,3,4,10,10 - hexachloro - 1:4,5:8 - di - endomethano - 1,4,4a,5,8,8a - hexahydro - naphthalene, the active toxic ingredients of such composition being mutually activating.

2,538,687. Insecticidal Composition Comprising 1-p-Chlorophenyl-2-Nitro-1-Tolylpropane. Patent issued January 16, 1951 to Henry B. Hass, West Lafayette, Ind., and Maynard B. Neher, Athens, Ohio, assignors to Purdue Research Foundation, Lafayette, Ind. An insecticidal composition containing, as the active insecticidal component thereof, 1-p-chlorophenyl-2-nitro-1-tolylpropane.

2,538,724. 2-Chloro-1-p-Chlorophenyl-2-Nitro-1-P-Tolylpropane and Insecticidal Compositions Containing It. Patent issued January 16, 1951 to Henry B. Hass, West Lafayette, Ind., and Maynard B. Neher, Athens, Ohio, assignors to Purdue Research Foundation, Lafayette, Ind. 2-chloro-1-p-chlorophenyl-2-nitro-1-p-tolylpropane.

2,538,728. Composition for Control of Mites and Insect Pests. Patent issued January 16, 1951 to Eugene E. Kenaga, Midland, Mich., assignor to The Dow Chemical Co., Midland, Mich. A composition for the control of mite and insect pests comprising as active toxic ingredients (1) 1,1-di(4-chlorophenyl)-2,2,2-trichlorethane and (2) 4-chlorophenyl ester of 4-chlorobenzene sulfonic acid, the active toxic ingredients of such composition being mutually activating.

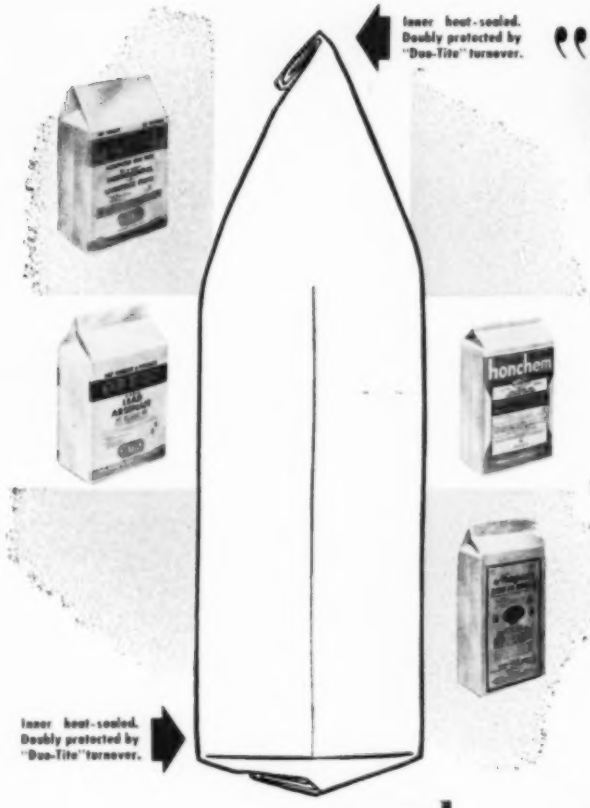
2,538,729. Composition for Control of Mites and Insect Pests. Patent issued January 16, 1951 to Eugene E. Kenaga, Midland, Mich., assignor to The Dow Chemical Co., Midland, Mich. A composition for the control of mite and insect pests comprising as active toxic ingredients the 4-chlorophenyl ester of 4-chlorobenzene sulfonic acid and (2) the gamma-isomer of benzene hexachloride, the active toxic ingredients in such composition being mutually activating.

2,539,269. Insecticidal Composition. Patent issued January 23, 1951 to Thaddeus Parr, Philadelphia, Pa., assignor to the Pennsylvania Salt Manufacturing Company, Philadelphia, Pa. An insecticide composition comprising a normally solid substantially non-water-soluble compound toxic to insects dissolved in an organic solvent for said compound, an emulsifier for said organic solvent other than polyvinyl alcohol, and enough water soluble polyvinyl alcohol to substantially saturate said organic solvent.

2,539,909. Insecticidal Composition Comprising the Reaction Product of Ethylene Chlorohydrin and 4-Vinyl-Chlorohexene. Patent issued January 30, 1951 to Herbert L. Johnson, Media and Archibald P. Stuart, Norwood, Pa., assignors to Sun Oil Company, Philadelphia, Pa. A novel insecticidal composition of matter comprising a minor portion of the beta-chloroethyl ether reaction product obtained upon causing from 0.5 to 5 moles of ethylene chlorohydrin to interact with one mole of 4-vinylcyclohexene at a temperature of from 50° C. to 150° C. in the presence of an acid-acting catalyst, and a major portion of kerosene.

2,539,910. Insecticidal Composition Comprising 1,4-Dithiocyanobutene-2. Patent issued January 30, 1951 to Herbert L. Johnson, Media and Archibald P. Stuart, Norwood, Pa., assignors to Sun Oil Company, Philadelphia, Pa. An insecticidal composition comprising a major proportion of petroleum spirits, a substantial proportion of methylethyl ketone and a lesser proportion of 1,4-dithiocyanobutene-2.

Positively will not permit ***SIFTING***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If there is any bag that positively won't permit dry particles to sift, this is it! Betner's new method of construction combines special liners with folding, gluing and heat-sealing in such a way that there is virtually "No Sift" for contents. This new Betner bag is perfect for insecticides, fertilizers and other chemicals that must be packaged in sift proof containers. It is also ideally suited for packaging foods. Available in sizes holding from 1 to 25 lbs. of bulk powdered material; can be pre-printed up to four colors; and can be made in several combinations of materials.

and...

Betner can supply the special machinery for closing the "Duo-Tite" bag . . . it heat-seals, double folds and pastes the tops in exactly the same manner as the bottom is constructed.

A complete bag service...

from idea to finished bag to machinery for closing bags and filling and closing liner bags for cartons. Your inquiries are welcome, and samples with full technical information will be supplied promptly.

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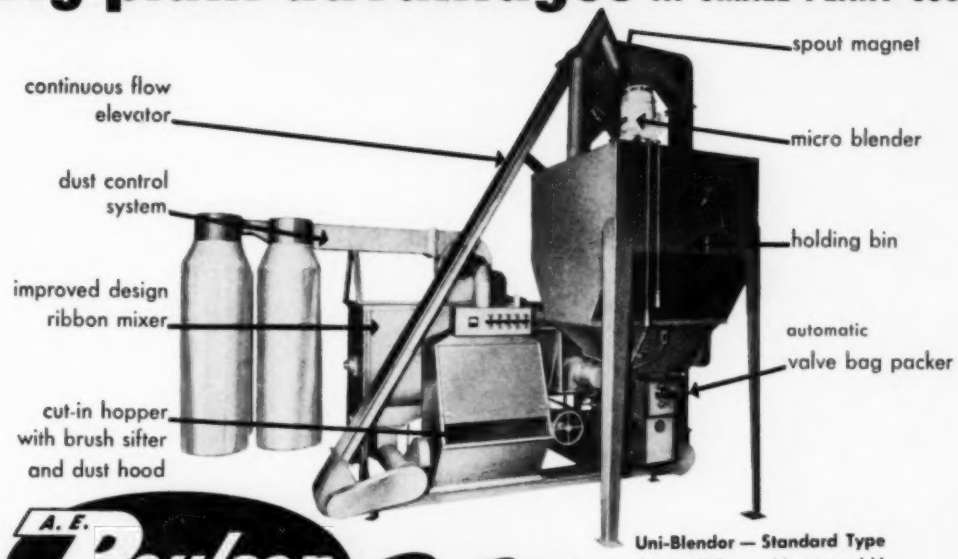
FOR ALL PROCESSES OF INSECTICIDE PRODUCTION

Big plant advantages AT SMALL PLANT COST



A. E. Poulsen & COMPANY R.T.R.* UNI-BLENDOR

PATENT APPLIED FOR

Uni-Blendor — Standard Type
COMPLETE... nothing to add!

The R.T.R. UNI-BLENDOR incorporates all of the advantages of individually designed plants at materially lower cost. The units are designed by engineers who are recognized specialists upon insecticide processing equipment. A type is manufactured for each process of producttion.

R.T.R. UNI-BLENDOR
Standard Type

Engineered to mix and blend dust concentrates with diluents to produce finished field-strength products of consistently uniform quality. Requiring only 9' x 12' of floor space and 13' of head room, the equipment can be readily and immediately installed in most existing buildings. The Uni-Blendor Standard Type produces up to four 40 cu. ft. batches per hour.

R.T.R. UNI-BLENDOR
Hi-Capacity Type

Designed for the same production process as the R.T.R. Uni-Blendor Standard Type, and producing up to seven 40 cu. ft. batches per hour, is provided for operations requiring quantity production.

R.T.R. UNI-BLENDOR
Dual Type

Engineered to perform a dual function — the formulation of dust concentrates from technical grade toxicants and also the production of finished field-strength products.

*Ready to Run...and ready to earn

Each type of R.T.R. Uni-Blendor is a complete, compact, Ready to Run plant — nothing to add. Each unit is plant tested for maximum efficiency and shipped in sections which any mechanic can assemble.

The R.T.R. Uni-Blendor reduces the investment in equipment, eliminates the expense of remodeling buildings, avoids delays of installation, avoids disappointments in operation and production—all of which are frequently involved in specially designed equipment.

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☐ Standard ☐ Hi-Capacity ☐ Dual

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MORE STATES RECOMMEND PARATHION

More and more state agriculture departments are recommending parathion as an insecticidal chemical. Among them: Texas, for cotton; Wisconsin, for vegetables, corn and alfalfa; New York, for fruits and vegetables; Georgia, for cotton.

Niran, Monsanto's parathion (Diethyl p-nitrophenyl thionophosphate) is one of the most effective insecticidal chemicals known for controlling aphids, mites, caterpillars, beetles and scales. It is a contact, stomach and vapor poison, with high toxicity. Monsanto Niran is used in orchards, citrus groves, greenhouses, truck gardens, forage-crop fields and small-grain fields.

Niran can be handled safely with proper precautions, but, like electricity, improperly used it can be dangerous. For easy-to-follow safety methods and information on formulating and applying Monsanto Niran, write for Technical Bulletin No. O-52, "*Niran*." For information on availability, get in touch with the Monsanto Sales Office nearest you or write to MONSANTO CHEMICAL COMPANY, Organic Chemicals Division, 1700 South Second St., St. Louis 4, Missouri.

DISTRICT SALES OFFICES: Birmingham, Boston, Charlotte, Chicago, Cincinnati, Cleveland, Detroit, Houston, Los Angeles, New York, Philadelphia, Portland, Ore., San Francisco, Seattle. In Canada, Monsanto (Canada) Ltd., Montreal.

Niran. Reg. U. S. Pat. Off.

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CHEMICALS — PLASTICS

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Suppliers' Bulletins

New Faceshields Offered

Mine Safety Appliances Co., Pittsburgh, has announced a new line of face shields, now available. Of two types, the "chempruf" for guarding against chemical splash and the "shipruf" for protection against light flying particles, the visors are interchangable on the standard MSA "Headline" headgear. A descriptive bulletin, No. CN-4, may be obtained from the company.

•

Poulsen Offers Literature

Literature on its line of blending machinery is offered by A. E. Poulsen & Co. The firm manufactures three types of equipment: "Standard;" "Hi-Capacity;" and the "Dual" type. The equipment is complete, and ready to run, the makers state. For details, write A. E. Poulsen & Co., Dept. 3, 2025 San Fernando Rd., Los Angeles 65, California.

•

Offers Grinder Catalog

Pulverizing Machinery Co. has offered a new illustrated catalog describing its line of "Mikro" equipment for grinding of chemicals, insecticides, etc. The machinery is classified as the "Pulverizer" for fine grinding, and the "Atomizer" for ultra fine grinding. Write for bulletin at Pulverizing Machinery Co., 39 Chatam Rd., Summit, N. J.

•

Booklet Describes Sprayer

Oklahoma Agricultural Experiment Station, Stillwater, has issued a booklet recently, describing a new general purpose farm sprayer for use with a tractor outfit. The booklet was witten by W. S. Wood and W. J. Oates, department of agricultural engineering of Oklahoma A. & M. The sprayer was designed for four major types of work: weed control, insect and plant disease control, livestock spraying and cotton defoliation. It can be used for row crops or broadcast spraying and can be built either as a trailer unit or mounted on a tractor. When mounted, it can be both attached and removed with ease. The booklet contains photos and drawings showing all details of the sprayer.

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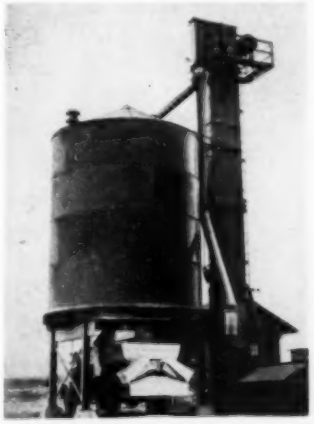
Johnson Co. Literature

C. S. Johnson Co., makers of blending plants, has prepared literature to describe its fertilizer blending



Pictured is a bulk phosphate storage plant with a silo capacity of 150 tons. The single-compartment steel silo features knock-down, field-boiled construction for ease in erection. The height is 29 feet, plus 9-foot legs for truck clearance. Two rotary plug valves located at bottom of the silo control amount of phosphate batched into trucks.

plants, bulk phosphates storage plants, aeration systems, screw conveyors, bucket elevators, bins, hoppers, batchers and clamshell buckets. These products, according to the company, are designed to meet the special blending requirements of fertilizer manufacturers. Write C. S. Johnson Co., Dept AG, Champaign, Illinois, for literature.

•

Subject Indexes Released

Technical Information Service, 732 Woodward Bldg., Washington 5, D. C. has announced the release of the first two volumes of subject indexes to Publication Board Reports, covering chemicals and allied products, abstracted in the Bibliography of Scientific and Industrial Reports, presently known as Bibliography of Technical Reports, published by the Office of Technical Services, U. S. Department of Commerce, Washington. The first two volumes cover agricultural chemicals and analytical chemistry. When completed, there will be twelve volumes in all, covering such fields as detergents, dyes, inorganic chemicals, paints and varnishes, etc.

Each volume is divided into five sections; subject index, numerical index, index to authors, agencies and companies, correlations with PB number and abstracts. The set is for use by chemists, physicists, biologists, technical librarians, directors of research and others.

•

Dow Periodical Out

Dow Chemical Co., Midland, Michigan, has issued its spring number of *Down to Earth*, featuring brief articles on weed control in onions and in cotton, another on the relative tolerance of crops to "Sodium TCA 90%"; and a one-page description of the insecticide, "Metacide". The magazine is available from the company upon request.

•

NY Station Report Issued

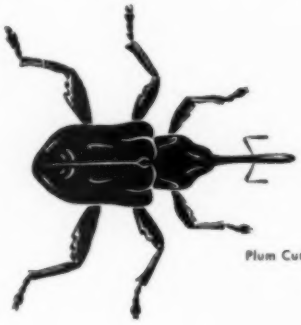
The sixty-ninth annual report of the New York State Agricultural Experiment Station, Geneva, N.Y., has been issued for 1950, under the authority of Cornell University. The booklet carries reports of numerous entomological investigations for control of bean beetle, orchard mites.

A study of late blight conditions in the state is presented, with full information on spray schedules for control not only of blight, but also of other plant diseases occurring in the area. One chapter deals with the development of new fungicides, the improvement of spray formulae, the inter-relationship of fungicides and means of expediting their application.

Cotton Boll Weevil

Tomato and Tobacco Hornworm

European Corn Borer



Plum Curculio

Extended Killing Power

ARMOUR STICKER keeps insecticides on the plant longer!

Every year the American farmer spends thousands of dollars for insecticides and fungicides that are washed off the plant foliage before they give maximum protection from insect and disease damage. The use of Armour Sticker now makes it possible to guard against this loss.

Armour Sticker consists of natural animal proteins fractionated and blended to exact specifications for solubility, adhesiveness, light sensitivity and water resistance. According to Crop Protection Institute Bulletin No. 72 by Dr. B. Elwood Montgomery, entomologist at Purdue University, "Chemical analyses indicate the original deposit from a spray or dust on slick foliage such as peach, corn, etc., is increased materially (as much as 100%) by the addition of Armour Sticker to the mixture."

Coverage — Armour Sticker not only increases the deposit of the pesticide, but it also gives more uniform coverage of the foliage. This uniform film results in better control of insects and disease and also reduces burning from "spot-type" deposits.

Reduced Run-Off — Armour Sticker's high initial deposit and even coverage insures a minimum amount of run-off. Chemical analyses, visual ratings and tests of the toxicity of residues to caged insects indicate an improvement in the retention of effective deposits by the addition of Armour Sticker to dusts and sprays.

Weatherability — When an insecticide containing Armour Sticker is applied to foliage and exposed to light for two to three hours, it becomes water-resistant and capable of withstanding rainfall and wind for a prolonged period of time.

Removal of Residues — Armour Sticker's smooth, even cover insures easier residue removal, with either brushing or washing.

Compatibility — Armour Sticker is compatible with all inert materials, as well as all commonly used fungicides and insecticides such as DDT, chlordane, lead arsenate, parathion, methoxychlor, sulphur, mercuric and copper compounds and the carbamates.

Toxicity — Four years of field use has proven Armour Sticker to be non-toxic to plant and animal life.

Armour Sticker is a product of eight years of intensive research and has been tested on all types of crops. For the past two years commercial growers have been successfully using it. Armour Sticker can help extend the killing power of your insecticide, fungicide or herbicide.

Armour Sticker is available in any quantity, packaged in 100 pound containers. Write today for detailed information.

ARMOUR *Adhesive Division*

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Technical Briefs

ACS Pesticide Papers

The Boston Session of the American Chemical Society's 119th meeting was to be held April 1-5. The Division of Agricultural and Food Chemistry was scheduled to meet Monday afternoon, April 2, with Dr. J. L. St. John and L. G. Cox, chairman and secretary, respectively, of the pesticides subdivision. Dr. H. L. Haller, U.S.D.A., Washington, D. C., was to preside on the first day of the symposium on Methods of Analysis for Micro Quantities of Pesticides. Wednesday's session was to be under the chairmanship of Mr. Cox.

Following the Boston session, the A.C.S. convention was to move to Cleveland, Ohio, where the sessions were to continue from April 8 to 12.

Below are abstracts of some of the papers scheduled to be presented at the Boston meeting, reprinted with permission of the American Chemical Society:

ANALYSIS OF DDT INSECTICIDE RESIDUES ON CORN. A COMPARISON OF ANALYTICAL METHODS. Jack E. Fahey and Harold W. Rusk, U. S. Department of Agriculture Bureau of Entomology and Plant Quarantine, Vincennes, Ind.

In order to develop a rapid method for the analysis of DDT residues on corn plants the Schechter-Haller colorimetric, the Stiff-Castillo colorimetric, and the organic chlorine titration methods of DDT analysis were compared. Modifications of these methods to adapt them to the routine study of DDT residues on corn are described. The organic chlorine technique was found to be best adapted to quantities of 2 or more mg. of DDT, which is above the range of residues found on corn samples normally sprayed for European corn borer control. The Schechter-Haller method gave from 95 to 128 per cent recovery of 25 to 200 micrograms of DDT added to a solution of corn residues with a standard error of from 0.19 to 0.98 per cent of the mean. The Schechter-Haller technique requires 11 operational procedures and a single analyst, with moderate equipment, could not be expected to complete more than 12 analyses of residue solutions in a working day. The Stiff-Castillo colorimetric method gave from 92 to 112 per cent recovery of 25 to 200 micrograms of DDT added to a solution of corn residues with a standard error of 0.3 to 1.7 per cent of the mean. The Stiff-Castillo technique involves only 5 operational procedures, none of which are time-consuming, and an analyst with simple laboratory equipment can complete the analysis of 60 samples of DDT solutions in a working day.

EFFECT OF FEEDING DDT-DUSTED ALFALFA HAY TO SWINE AND POULTRY. L. E. Harris, C. I. Draper, J. R. Harris, F. Mangelson, D. A. Greenwood, C. Biddulph, and W. Binns, Utah Agricultural Experiment Station, Logan, Utah.

This investigation was conducted to determine whether sufficient DDT remains on DDT-treated alfalfa hay to cause toxic effects to carry over to the tissues and eggs when fed to swine, chickens and turkeys.

In the swine experiment four plots of alfalfa were dusted with 2 pounds of

PICCO hi-solv 30

a light petroleum solvent

for Insecticide Concentrates

This highly refined aromatic petroleum naphtha combines high solvency with the ideal rate of evaporation for insecticides. Extensive use has shown Picco Hi-Solv 30 to be an excellent vehicle for insecticides such as DDT, chlorinated camphene and the like.

We will be glad to send complete data and samples for testing.

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INDUSTRIAL CHEMICAL CORPORATION
CLAIRTON, PENNSYLVANIA
Plants at Clairton, Pa., West Elizabeth, Pa., and Chester, Pa.

technical DDT per acre. Control hay was obtained from four other undusted plots. The hay was ground and incorporated into diets containing 0, 3, 6, 9, 12, 15, 19, 21, 24, 27, 30, and 33 per cent alfalfa hay. This hay replaced the same amount of barley in a complete diet for swine.

Fifty-six day-old male and female pigs were fed diets containing the DDT-treated and control hays. They were fed until they weighed approximately 210 pounds, at which time they were slaughtered. DDT analyses were made on kidney fat, bacon, and shoulder. The liver, spleen, and kidney were studied histologically.

In the poultry experiments alfalfa was dusted with 0, 1, 2, and 4 pounds of technical DDT per acre. The harvested hay was ground into meal and incorporated into a mash containing 15 per cent alfalfa meal. DDT was also added to mash made with untreated alfalfa hay at the levels of 0, 50, 100, and 200 p. p. m. of mash. Laying hens, chicks, and turkey poults were fed the mash containing the DDT-treated and control hays. Weight gain, mortality, and egg production records were kept. After the birds were sacrificed, chemical analysis of feed, eggs, and tissues was made for their DDT content.

THE SAMPLING AND ANALYSIS OF SOILS CONTAINING CERTAIN INSECTICIDE RESIDUES. R. D. Chisholm and L. Koblitsky, U. S. Department of Agriculture, Bureau of Entomology and Plant Quarantine, Moorestown, N. J.

The concentrations of insecticide residues in soils may be expressed on a weight-volume basis (pounds per acre of specified depth) or on a weight-weight basis (parts per million). In the sampling of soils consideration is given to the depth to which an insecticide has been deposited and to the unformity of its vertical and lateral distribution. Samples are usually composites of a number of cores and should have an insecticide concentration similar to the average of the concentrations throughout the area sampled. DDT and chlordane may be removed from suitable soil aliquants by extraction with a mixture of 2 + 1 parts by volume of benzene and isopropyl alcohol. Methods for the analysis and determination of specific insecticides have not been applied successfully to their determination in all types of soils. Many soils contain extractable materials that interfere with such determinations. DDT and chlordane equivalents calculated from organic determinations of extracts from a variety of soils were close to the amounts of these insecticides in the soil, as demonstrated by biological assays. A lead arsenate equivalent may be calculated from an arsenic determination of a solution recovered by distillation following reduction with a hydrazine-sodium in the presence of hydrochloric acid and soil.

ANALYTICAL METHOD FOR PARATHION AND POSSIBLE METABOLITES IN THE MILK, BLOOD AND URINE OF DAIRY COWS. Joe E. Pankaskie, F. C. Fountaine, and Paul A. Dahm, Kansas Agricultural Experiment Station, Manhattan, Kan.

A procedure involving the use of a liquid-liquid extraction apparatus has been developed which makes possible the application of the sensitive Averell and Norris colorimetric method for parathion to the analysis of milk. Essentially this procedure involves a 6-hour percolation of petroleum ether through a column of milk and ethanol. Standard curves have been prepared from data obtained by adding known amounts of parathion, ranging from 20 to 200 micrograms, to 100-gram samples of milk.

This procedure has been used in the following parathion-feeding experiments: Then dairy cows were allotted into two groups and fed a wettable powder formulation of parathion at levels of 5 and 1 p.p.m., based upon an estimated roughage dry matter intake of 2.25 pounds per 100 pounds of body weight daily, continuously for 81 days. At the conclusion of this experiment, two of these cows were fed increasing amounts of parathion up to 40 p.p.m. Later, five dairy cows were fed alfalfa hay containing an average parathion residue of 15 p.p.m. for 60 days. In none of these experiments was any parathion found in the milk of the cows.

Studies have been made also on the metabolic rate of parathion in the dairy cow and the effect of parathion on the plasma and red cell cholinesterase.

B&B

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AGRICULTURAL CHEMICALS
INDEX of ARTICLES
1950

Articles are cross-indexed by listing the principal word of the title as well as the proper name of the article. Indexed by authors' names is also included.

— A —

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Zukel, John W.; Use of Maleic Hydrazide as a Plant Growth Inhibitor ——May 35

CONTAMINATION OF MEAT BY CHLORINATED HYDROCARBON INSECTICIDES USED FOR INSECT CONTROL. H. V. Claborn, H. F. Beckman, R. D. Radeleff, W. J. Nickerson, and R. W. Wells, U. S. Department of Agriculture, Bureau of Entomology and Plant Quarantine, Kerrville, Tex.

The chlorinated hydrocarbon insecticides have been shown to be absorbed through the skin and stored in the fat of animals treated with them for insect control. These insecticides may be stored in the fat of animals fed forage crops which have been treated for insect control.

Fat samples were taken from calves by biopsy at intervals following single spray treatments with DDT, TDE, methoxychlor, and lindane applied at concentrations required for insect control. Analyses of these samples shows the levels reached and the persistence of the insecticides in the fat. Fat samples were taken and analyzed which show the levels reached and the persistence of the insecticides in the fat following repeated applications of DDT, TDE, methoxychlor, lindane, chlordane, toxaphene, and technical BHC at concentrations normally required.

The contamination of fat due to 28 days' feeding of 10 p.p.m. of DDT, methoxychlor, or toxaphene, and that due to 56 days' feeding of 25 p.p.m. of aldrin, dieldrin, or chlordane in the diet was determined.

A METHOD OF ASSAY FOR ISOPROPYL N-PHENYL CARBAMATE. Leavitt N. Gard, Pittsburgh Plate Glass Co., Columbia Chemical Division, Barberton, Ohio.

The use of isopropyl N-phenyl carbamate as a selective weed control chemical has created the need for an analytical method of determining the purity of the commercial product. Consideration of the chemical structure of the molecule indicated that hydrolysis and subsequent carbon dioxide analysis might serve this purpose. Attempts to hydrolyze this compound in the conventional alkaline medium were unsuccessful and led to erratic results. An acid hydrolysis of the carbamate, however, gave very satisfactory values with a calculated accuracy of 99 per cent.

The acid hydrolysis is conducted by heating and refluxing the sample with a mixture consisting of 91 per cent by volume of phosphoric acid (85 per cent solution) and 9 per cent by volume of concentrated sulfuric acid for a period of one hour. A sepcial apparatus is described wherein the hydrolysis and liberation of carbon dioxide occur simultaneously. The carbon dioxide is absorbed in an excess of standard sodium hydroxide and determined titrimetrically after treatment with barium chloride solution. The alkali consumption thus serves as a means of measuring the carbon dioxide which may be used to calculate the purity of the ester.

The technique of acid hydrolysis has been found applicable to other carbamate esters where alkaline hydrolysis has failed.

COLORIMETRIC DETERMINATION OF OCTAMETHYL PYROPHOSPHORAMIDE. S. A. Hall, J. Wm. Stohlman III, and M. S. Schechter, Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture, Beltsville, Md.

A sensitive method for determining octamethyl pyrophosphoramide was developed primarily to determine minute quantities of the new systemic insecticide in plant material as a result of spray or soil applications. The method is based upon (1) chloroform extraction of the sample to be analyzed, (2) acid hydrolysis of the octamethyl pyrophosphoramide in the extractive to dimethylamine hydrochloride, (3) steam distillation with excess alkali in a Kjeldahl distillation apparatus, the dimethylamine being absorbed in hydrochloric acid, and (4) development of the color in a separatory funnel by shaking with alkali, copper reagent, and a measured volume of chloroform containing 0.5 per cent carbon disulfide to produce in the chloroform layer the yellow color of cupric dimethyldithiocarbamate, the intensity of which is measured in a photometer.

(Turn to Page 105)

Make Sulfuric Acid from Refinery Sludge

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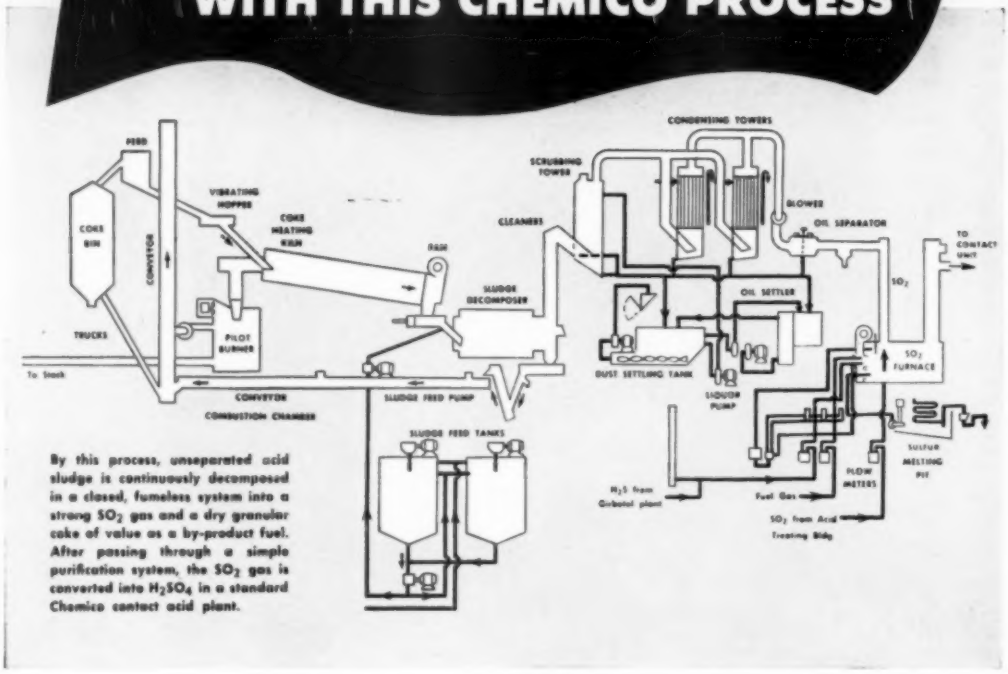

By this process, unseparated acid sludge is continuously decomposed in a closed, fumeless system into a strong SO_2 gas and a dry granular coke of value as a by-product fuel. After passing through a simple purification system, the SO_2 gas is converted into H_2SO_4 in a standard Chemico contact acid plant.

With the increasing shortage of raw sulfur, industry is turning to other materials which can be used for making much-needed sulfuric acid. An important source—waste oil refinery sludge—can be converted into clean sulfuric acid of any desired strength by the Chemico process shown in the flow diagram.

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Purdue Short Course Held

Numerous problems in connection with aerial application of pesticides were discussed at the Short Course on Uses of Aerial Equipment in Agriculture at Purdue University, March 12 and 13. In charge of the first session was Dr. J. J. Davis, Purdue Univ. Topics of the morning included "Application of Herbicides by Plane for Control of Weeds and Brush", by O. C. Lee; "Use of Plane for Seeding & Fertilizer Application", by H. R. Lathrope; and "Use of Plane for Plant Disease Control", by R. W. Samson. Safety in use of insecticides was discussed by R. T. Everly.

Paul Ulman was chairman of the afternoon session in which the group discussed state regulations, the importance of job reports and timing of applications.

C. F. Cornish was chairman of the March 13th morning program which considered equipment problems, legal aspects of airplane operation, and control of forest insects. The afternoon program was devoted to a panel on looking into the future, as to new uses, legislation and general needs.

•

Thurston Appoints Simms

William R. Thurston, president of Thurston Chemical Company of Joplin, Missouri; Tulsa, Oklahoma, and Lawrence, Kansas, has announced the appointment of Robert S. Simms as assistant to the president.

For the last 24 years, Mr. Simms has been associated with the Naco Fertilizer Company of New York City. He resigned February 15 as president, general manager and director to join the Thurston company.

Thurston said Mr. Simms will be assigned to duties created by company expansion and other duties resulting from regulations concerning allocations, pricing and related problems.

Before entering business, Mr. Simms studied agriculture at the University of Illinois and since that time has played an important part in the growth of the fertilizer industry.

To Seek Sulfur Sources

Freeport Sulphur Co. has announced that its 1950 production was greatest in the company's history, amounting to almost 2½ times the average of 1935-39. It also states that it soon will build a new sulfur mining plant at a small deposit in Louisiana, and that exploratory drilling for sulfur will be conducted at four other marsh salt dome locations in that state.

Quaker Oats Fellowship

Mellon Institute, Pittsburgh, Pa., has announced that The Quaker Oats, Company of Chicago, Ill., is the donor of a new fellowship relating broadly to research on the utilization of by-products from the manufacture of furfural. Charles E. Colwell, incumbent of the fellowship, has the close collaboration of Quaker Oats specialists.

At present furfural by-products are being utilized in fertilizer.

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"Chemical Facts and Figures" Published

Chemical Facts and Figures third edition, published by the Manufacturing Chemists' Assoc., Inc., Washington, D. C. 419 pages, 8 x 10½ inches, paper cover, price $3.00.

Statistics on United States production, sales, imports, exports, and prices of chemicals, chemical products, and chemical raw materials for the period 1946 through 1949 are contained in this new third edition of the Manufacturing Chemists' Association's chemical fact book. The volume also contains partial data on the first six months of 1950.

Production and consumption figures, of interest particularly to the agricultural industry, include the following products: fungicides, plant hormones, herbicides, fertilizers, ammonium nitrate, pyrethrins, DDT and other insecticides, etc. Imports and exports of the items mentioned are included also.

Statistics on employment and wages are considered in still another section of the book. Data on deaths and injuries in chemical plants, and in chemical transportation, due to handling chemicals are listed also.

In addition to U. S. data, the book contains available Canadian statistics, including a newly added section on minerals. The present volume includes about 500 chemicals on which statistical data have become available since the last edition.

ALABAMA MEETING

(Continued from Page 79)

legislation on agricultural pesticides. Farmer's problems of obtaining insecticide analyses and the farmer's viewpoint of aerial application were discussed by Howard Murfee, McQueen Smith Farms, Prattville, and Joe N. Poole of Butler Springs. Results and history of crop defoliations were reviewed by E. H. Wilson, American Cyanamid Company, Montgomery.

Other subjects on the program were concerned with new varieties of small fruits; nursery soils and fertilization; cold damage to ornamentals; mechanics of disease and insect damage to plants; insect and disease controls for vegetables, corn, peanuts, and legumes; characteristics of some common weedicides; important cotton insects in Alabama and how to control them; dangers and precautions in use of insecticides and fungicides; and legal aspects of aerial applications.

Other guest speakers were Assistant Attorney General Robert Straub; George Miller, Jr., attorney for the State Department of Agriculture and Industries; and P. R. Bidez, senior chemist, Department of Agriculture.

Experiment Station and Extension Service speakers were: L. M. Ware, horticulturist; J. A. Lyle, assistant plant pathologist; C. L. Isbell; R. L. Self, associate plant patholog-

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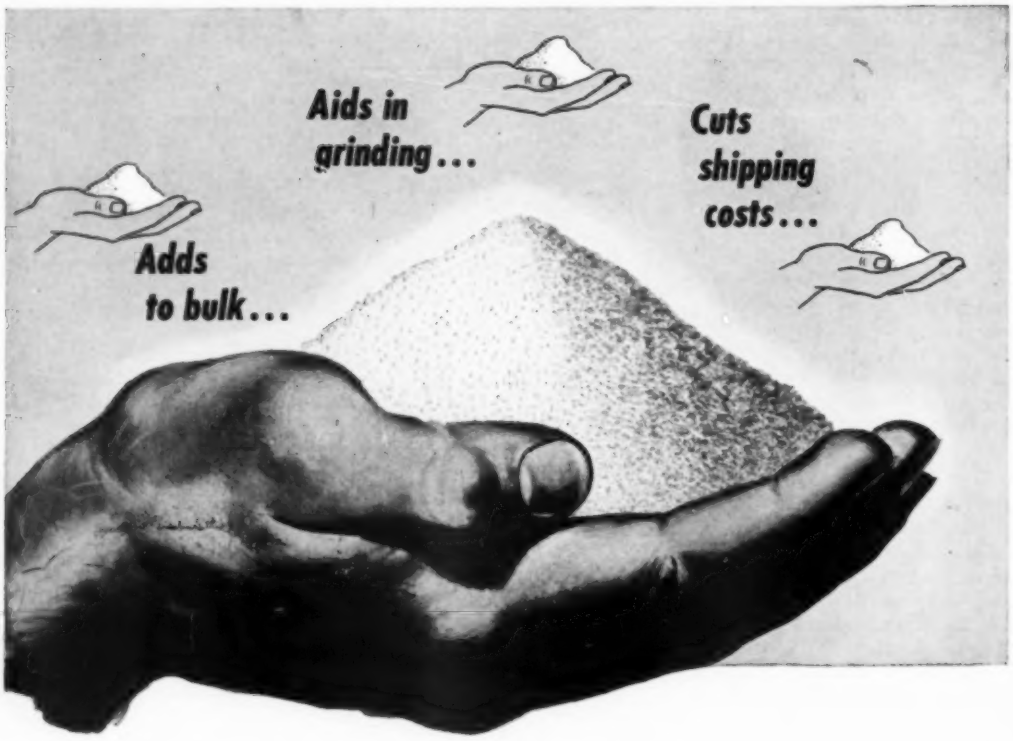

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ist; W. H. Greenleaf, vegetable breeder; John Bagby, extension horticulturist; T. B. Hagler, associate horticulturist; F. E. Guyton, professor of zoology-entomology; H. P. Orr, associate horticulturist; V. S. Searcy, assistant agronomist; W. G. Eden, associate entomologist, Coyt Wilson, assistant director; F. S. Arant, entomologist; W. A. Ruffin, extension entomologist; H. S. Swingle, fish culturist; and Frank Fitch, assistant wildlife research leader.

Presiding at the various sessions were Assistant Director Wilson; Frank Stewart, commissioner, State Department of Agriculture and Industries, Montgomery; L. H. Smith, director, National Flying Farmers Foundation, Lafayette; R. F. Hatcher, Tobacco By-Products and Chemical Corporation, Montgomery; and Asa Rountree, director, State Department of Aeronautics, Montgomery. James W. Wirwille, Pennsylvania Salt Manufacturing Company, Montgomery, presided over the panel discussion on the dangers and precautions in use of pesticides.

Manufacturers, mixers, and distributors represented at the conference included the following companies: Agricultural Sulfur and Chemical Co., Montgomery, Ala.; American Cyanamid Co.; Ashcraft-Wilkinson Co., Atlanta, Ga.; Brunswick Chemical Co., Brunswick, Ga.; California Spray Co., Tifton, Ga.; Capital Chemical Drug Co., Montgomery; E. I. DuPont de Nemours and Co., Atlanta; Flag Sulphur and Chemical Co., Tampa, Fla.; Florida Agricultural Supply Co.; Greenwood Products Co., Graceville, Fla.; Hercules Powder Co., Wilmington, Del.; Implement Sales Co., Atlanta, Ga.; Poyner Seed Co. Dothan, Ala.; Penn Salt Manufacturing Co., Montgomery, Ala.; Nor-Ala Seed Co., Birmingham, Ala.; Reimers Company, Foley, Ala.; Sawan, Inc.; Taylor Chemical Co., Aberdeen, N. C.; Dow Chemical Co.; Tobacco By-Products and Chemical Corp., Montgomery; V-C Chemical Corp.; Seed Insecticide Corp., Cordele, Ga.; John Bean Mfg. Co., Albany, Ga.; Triangle Chemical Co., Macon, Ga.; and Farmers Marketing and Exchange Association, Montgomery.

ACS ABSTRACTS

(*Continued from Page 99*)

The method as described is sensitive to the determination of about 5 micrograms of octamethyl pyrophosphoramide. By appropriate use of smaller volumes of chloroform-carbon disulfide and longer absorption cells, the sensitivity of the method can be considerably increased in the absence of an appreciable blank in the check sample.

WASHINGTON

(*Continued from Page 65*)

'open-end controls' will be carried out until the trend of exports is indicated. Eventually, it is hoped that export quotas by product and perhaps even by country will be established.

• • •

The threatened shortage of steel containers is perhaps the biggest single problem insofar as the agricultural pesticide industry is concerned. With the trend in the past

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two years for the increased use of emulsifiable concentrates, a greater quantity of these liquid materials have been shipped in metal cans of capacities from one gallon up to 55 gallons. A recent survey indicated that approximately 25,000 tons of steel is necessary to furnish the containers required for shipment of pesticidal chemicals. It is felt by most of the industry at the present time that drums will be short by 20-25%, particularly in view of the fact that the take in 1951 is based upon the 1950 consumption of steel.

In line with this, many companies are talking about using returnable drums, but as the N.A.C.A. has pointed out, there are very serious problems in connection with this practice. For example, a 2,4-D drum should never be re-used because of the seriousness of contamination and the difficulty of thorough cleaning. However, there are certain types of concentrates which lend themselves to the use of returnable drums under certain conditions, and this practice should be instituted wherever possible.

* * *

No allocation of fertilizers is planned unless supplies become so short as to make crop production problems critical. This was the message passed along to members of the Fertilizer Industry Advisory Committee by L. B. Taylor, director, Office of Materials and Facilities, USDA, at the initial meeting of this committee, March 8. See Pg. 81 for list of members.

* * *

We suggested in this column last month that the DDT set-aside percentage might be reduced. As predicted, the DDT Industry Advisory Committee, at a meeting March 21, urged the government to drop from 25 to 20% of their monthly production the amount of DO rated orders they must accept. Fewer orders than expected from military needs were placed during the first quarter of 1951. January production of DDT, they reported, was at an all-time high of 7,600,000 lbs.

* * *

Acute supply problems confronting the fertilizer industry in-

clude the shortage of bags, caused by heavy Army demands on bag manufacturers, and the shortage of boxcars which continues serious enough to delay shipments of potash, superphosphate and other basic fertilizer raw materials.

• • •

With many state legislatures again in session, the legal hopper has begun to fill again with various measures designed to control, and in some cases to interfere seriously, with use of agricultural pesticides. A particularly flagrant example of the latter type measure is Texas House Bill 593, introduced by McIlhaney and Hinson. It would require farmers desiring to apply pesticides to get permits, licenses, surety bonds, pay fees, etc.

2, 4-D and 2, 4, 5-T

(*Continued from Page 40*)

weeds were not a problem in winter wheat. Late last June during a trip from North Platte, Nebraska to Hays, Kansas, the writer noted only three fields of winter wheat along this route that had been treated with 2,4-D. In 1949, approximately 80% of the fields along this same route had been treated with 2,4-D. The major portion of 2,4-D application to hard red winter wheat will probably always be made by plane, and when weather conditions are such that annual weeds threaten this crop, airplane application of herbicides will be a major factor in their control. The relatively large scale units of production, the advanced stage of growth at which this crop is most economically treated, and the seriousness and extent of weed infestations which periodically develop in winter wheat production, make aerial application of herbicides in this crop more practical than in the spring grain producing areas of the northern states and Canadian provinces.

In the major spring grain producing states of South Dakota, North Dakota, Iowa and Minnesota, while the total reported acreages treated are not greatly reduced from those of 1949, the total acreage treated by plane in 1950 was greatly reduced. This is partly accounted for by the fact that a tremendous number of farm operators in these States now own and operate their own efficient ground spraying machinery. Other contributory factors were the unfavorable weather conditions—extremely late spring, excessive moisture in early spring followed by cold, dry weather, and the pessimism regarding dollar value of crops in the early part of the season. These factors have this past year; and will in future years, play an important part in determining the relative extent of use of herbicides for control of weeds in this area. They will influence the extent of aerial application of herbicides to a greater extent, relatively, than the total annual use; due to the fact that aerial spraying has been, and will be, more expensive on a unit area basis than ground applications, and further due to the fact that aerial application has been employed in this region to

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the greatest extent on marginal areas of production. Unfavorable weather conditions, or unfavorable future markets, become critical factors in small grain production or marginal areas before they do on well established, more dependable, producing areas. For these reasons the potential market for aerial spray application of 2,4-D in the northern states of this area will always be unpredictable and uncertain and bound to fluctuate from season to season. It will never, however, be as great a potential market for aerial application as is that offered by the winter wheat and range regions.

The statement of factors in the last paragraph could be repeated, as explaining why aerial application has played such an insignificant part in the use of 2,4-D in the Canadian Provinces of Alberta, Saskatchewan and Manitoba. Instead, these factors will be accentuated by emphasizing that the potential profit margin and the disposable production ceiling on wheat, oats, barley, flax and rye, has for the Canadian farmer, been much more limited and restricted than for the state-side operator in the past several years. Due to these latter facts, it has been essential that the Canadian farmer adhere to the strictest details of economy in order to operate at a profit. The Canadian farmer has, therefore, considered cost and economy more consistently than has the producer in the 14 states to the south of him. Data of our recent survey indicate that this closer economy of operation has prompted the Canadian farmer to expand vastly his use of 2,4-D for weed control, but to by-pass almost entirely aerial application of this herbicide and adopt the more economical method of ground spray or dust application.

Future Outlook Bright

RECENT developments in research and engineering have greatly improved the outlook for continued and greatly expanded use of herbicides by aerial application under conditions not suited to ground application. As stated earlier, only air-

plane application has made the use of 2,4-D for control of weeds in rice feasible. Texas reports indicate that in 1950, from 250,000 to 300,000 acres of rice were treated with 2,4-D in that state alone. In fact the 385,000 acres treated by plane in Texas in 1950 almost exclusively represent areas on which the operation of ground sprayers is impractical. Recent developments in use of 2,4-D and 2,4,5-T for mesquite control open up a potential field of millions of acres where ground driven sprayers have little or no possibility of use and our research work in this field of development has recognized these limitations. Consequently, such research has been aimed primarily at eventual aerial spray treatments. The field of control of hardwood species—oaks, hickory, elm and sassafras, in the cross-timber area; although not experimentally established as practical as yet, will open up an even greater field for the airplane application of herbicides than anything accomplished to date. Here again the research people well realize that control of the mixed timber on this tremendous area; which will result in expanded use and improvement of range forage, can be most economically accomplished only by wide-scale adoption of aerial appliation of the proper herbicides.

Formulations of 2,4-D and 2,4,5-T have in recent years been considerably improved from the standpoint of aerial application. A number of new esters of 2,4-D and 2,4,5-T have been developed which lend themselves admirably to low volume oil or oil-water emulsion application, and in addition have been greatly improved from a volatility hazard standpoint. There are at present numerous studies being undertaken to develop or select oil carriers, or emulsions, that will reduce the spray drift hazard now associated with aerial application of the highly toxic herbicidal materials. Equipment for aerial application of herbicides has likewise been markedly improved during the past several years.

One of the most gratifying observations made by the author during thte 1950 season is the marked decrease in number of reports of widespread damage to sensitive crops resulting from ground or aerial application of 2,4-D. This is reflected in the fact that the state of Texas with the strictest and most limiting regulations for the control of aerial application of 2.4-D, tripled the acreage treated with 2,4-D or 2,4,5-T over that of 1949. Further, with cotton growing relatively adjacent to almost every field in Texas treated with 2,4-D in 1950, we have had few reports of damage to this sensitive crop. This certainly indicates that aerial application is becoming safer and more practicable.

TOBACCO PESTS

(Continued from Page 61)

necessary to bring the pest under control.

Examinations of surface woods trash in North Carolina showed live

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boll weevils to be only about one-third as abundant in February of this year as they were in that area in March of 1950. In the counties where examinations were made, the number of live weevils per acre averaged 1,976 in February, 1951, as compared to 6,748 per acre in March, 1950. Reports (from Tallulah Louisiana, indicated that extremely low temperatures in that area in early February had caused some mortality of boll weevils hibernating in trash on the ground. The mortality, however, as determined from examination of surface trash about the middle of the month, was not as great as might have been expected.

A rather large number of live pink bollworms were reported in south Texas from surface cotton debris examined during mid- and late February. Inspections made in 73 fields in 18 counties during the week of February 18-24 showed an average of 48 percent live worms.★★

FUNGICIDE TESTS

(*Continued from Page 59*)

ized in Table 2. Counts were delayed to allow ample time for the development of symptoms in currently infected plants.

Benzene hexachloride gave nearly 4 percent depression in the spread of yellows, and parathion over 12 percent, compared with the untreated checks. The depression in the spread of yellows where benzene hexachloride and parathion were used does not seem impressive until the proximity of the mature field, which served as a constant source of viruliferous aphids, is considered. Data from the plots, however, indicate that the spread of yellows into new plantings cannot be satisfactorily prevented if aphids are left uncontrolled in nearby mature fields infected with the disease.

Many migratory alatae (winged aphids) were produced during the fruiting season of the strawberry. The first of these appeared soon after the blossoms began to open Winged aphids were present in numbers on May 17. On May 29, they were noted flying in great numbers from infected mature fields to newly planted fields. About six weeks later, July 9, yellows disease showed up all over the new plantings. Apparently it required about six weeks for the virus to produce symptoms. The infection was as high as 70 percent in many new plantings in the area as a result of the distribution of the virus by these migratory aphids.

While considerably less virus showed up in some of the treated plots than appeared in the untreated checks, no treatment gave adequate control. Alatae were found that had survived long enough to insert their mouth parts into the strawberry plants, even though the residual action of the insecticides had killed them soon after beginning to feed. In several instances, alatae were found dead and still attached to the plants by their mouth parts. Some of these had given birth to young. The young

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aphids apparently had been killed by the residue of the insecticides and some remained held in place by the plant hairs.

It was evident that protection of the new planting alone was insufficient, even though the insecticides gave good control of the aphids. Too many alatae lived long enough to transmit the disease to new plants even though they were killed soon after arriving.

When attempting to analyze the situation with reference to all possible factors, the question arose as to what stimulus or stimuli could cause the production of migratory alatae. Of those suggested, crowding seemed to be the most logical, if allowance were made for the possibility that numbers which might produce the effect of crowding of one species of insect might not apply to others. An infestation of the strawberry aphid never builds up in numbers comparable to those attained by such species as the bean aphid or the cabbage aphid. If crowding were responsible for the development of these winged migrants, then if the population were to be greatly reduced just before the initiation of this migratory period, the stimulus of crowding would be removed and few, if any, alatae would develop.

1949 Tests

PLOTS were established on an isolated farm where a new planting adjoined a mature field, to determine if the aphid population in the mature planting could be sufficiently reduced so that the new planting could be protected by periodic dusting.

The mature planting consisted of about four acres and was separated from the new planting by a driveway. It was so heavily infected with yellow disease that the grower had seriously considered plowing it under in the late summer of 1948. The new planting consisted of 120 rows ranging in length from 250-400 feet, making it possible to again use nine rows in each replicate and to replicate each treatment four times. Rows not needed for the plots were dusted periodically with parathion. Data were taken from the three center rows of each replicate. As nearly as could be determined, the stock used for the new planting contained from 10 to 15 percent yellows at the time of planting.

The mature planting was dusted on April 26 and 27 with parathion (1%) when the strawberry blossoms started to open, using about 40 pounds of dust per acre per application. The following dusts were used in the new planting within one week after planting: parathion (1%), TEPP (tetraethyl pyrophosphate, 1%, and BHC (benzene hexachloride, 1% gamma isomer). Both the mature planting and the new planting were again dusted two weeks later. By this time there was a considerable number of blossoms open in the mature planting so dusting was stopped to avoid danger of a poisonous residue on the fruit. Dusting was continued on the new planting, however, at intervals of

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two weeks up to July 21 (two weeks after the completion of harvest), using 8 to 10 pounds of dust per acre per application.

An examination of the mature planting when the second application was made disclosed that the aphid population had been greatly reduced by the first application. When data were being taken near the end of harvest, June 29, the aphid population in the mature planting was still very low. Moreover, no alatae were found in this planting at any time, though they were present in numbers in other plantings in the same neighborhood where no dusts had been applied. A very few winged aphids were found in the new planting. Apparently they flew in from the surrounding territory. Some of these had already been killed by the residual action of the insecticides. Counts made in untreated mature plantings in the same general area disclosed a heavy aphid population.

Just after harvest—the end of the aphid migratory period—the count in the mature field revealed 40 aphids per 100 trifoliate leaves, while in the adjoining plots the count per 100 trifoliate leaves was: benzene hexachloride 5; parathion 14; and tetraethyl pyrophosphate 16 (Table 3). A mature field a few miles away, which had not been treated, yielded 331 aphids per 100 trifoliate leaves. The same method of taking data was used as had been employed in 1947 and 1948.

The data on the aphids and on the spread of yellows in treated plots compare very favorably. The average percentage of yellows for each material in the plots when the data were taken in September was: benzene hexachloride 9.5%; parathion 13.37; and tetraethyl pyrophosphate 10.55. It will be recalled that the stock used in setting this field contained from 10 to 15 percent yellows when planted. These data have been summarized in Table 4. They show that the spread of the disease had been checked and apparently stopped. In untreated commercial fields in comparative situations, the incidence of yellows was generally around 75 percent.

These data show that the migration of aphids and the spread of yellows within a new field or from a mature field into an adjoining new field can be prevented or materially reduced.

Another planting was established on a stock farm in complete isolation from other strawberry fields. These plots were treated with dusts containing BHC (benzene hexachloride, 1% gamma isomer), parathion (1%) and TEPP (tetraethyl pyrophosphate, 1%) in five replications of nine 50-foot rows each. Applications were made at intervals of two weeks throughout the growing season, using 8 to 10 pounds of dust per acre per application. The planting stock contained only a trace of yellows. Immediately after planting, every tenth plant was replaced by one having the disease. Sixty-two days after planting, all diseased plants were removed.

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occasional aphid in these plots at any time during the growing season. Not one alatae was found. When the final data on the incidence of yellows were taken in September, the disease was found in correspondingly low percentages. These data are summarized in Table 5. The average percentage of yellows for each of the materials was: benzene hexachloride 1.67; parathion 0.72; and tetraethyl pyrophosphate 0.47.

The data from these plots indicate that yellows was controlled in an isolated field by keeping the aphid population down with an effective insecticide and by careful roguing.

Migratory aphids appeared again in 1949, just as they did in 1948. The only difference noted was that the population apparently took longer to build up in 1949. The winter of 1948-49 was much more severe than that of 1947-48. This may have reduced the population somewhat and caused the delay in the build-up of the insect. However, it began and ended very much as it did in 1948. Apparently we can safely tie the development of the population to the development of the strawberries or the host plant.

1950 Tests

GROWERS in the area had watched with great interest the progress of these efforts to control the yellows disease by controlling the strawberry aphid. Encouraged by the results, they organized early in 1950 to apply control measures on a county-wide basis.

Experimental results obtained in 1949 were so promising that the tests were repeated in 1950. Materials used and the timing of the applications all appeared satisfactory in 1941. So were the locations of the plots, particularly with reference to sources of infection and distribution of the aphid population. Moreover, the 1950 tests were a further check on the soundness of the program.

In addition to repeating the 1949 tests, four isolated plantings were established in four widely separated localities in western Washington. Each planting contained from three to six rows of yellows-free certified stock bordered on each side by four to six rows of stock containing approximately 20 percent diseased plants. Three of these plots were dusted with parathion at intervals of two weeks, beginning one week after planting and continuing until the end of August. The fourth plot was maintained as an untreated check.

Data on the effectiveness of the treatments were taken in the original test plantings soon after strawberry harvest had been completed. No aphids were found in any plots that had been dusted. A very few aphids were found in the adjoining mature field. This field had been dusted in 1949 and 1950. Applications were made early in the season to avoid a poisonous residue on the fruit. No alatae were found in either the experimental plots or the mature field. There was no increase in the incidence of yellows in either the mature field or in the new planting where test plots had been located.

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FERTILIZER APPLICATION

(Continued from Page 53)

far inferior to yields obtained from placing the material either under the row or in the shoulder of the bed. This should be expected, because fertilizer placed in the irrigation water is probably farther away from the plant than either of the other placements, at the time it is needed. It is difficult to see how application in the irrigation water could ever be better than placement in the shoulder.

Table 3 illustrates the yields obtained when onions received phosphorus applied in the various locations. In all comparisons, the plants received nitrogen from ammonium sulfate placed directly under the plant row previous to transplanting. It should be noted that here, again, best results were obtained from placement under the row. Next best results were from fertilizer placed in the shoulder of the bed. Application of liquid phosphoric acid in the irrigation water gave a significant increase in growth over the unfertilized plots, but not as good as those receiving the dry material placed in the most efficient locations.

Chart 4 also deals with onions where placement under the row and in irrigation water was compared with using different sources of nitrogen. When fertilizer was placed directly under the plant row, the highest yields were obtained from ammonium nitrogen. Next highest was obtained by nitrogen derived from urea and lastly, by nitrogen dederived from calcium nitrate. In none of the cases were the yields very greatly increased when the nitrogen was applied in the irrigation water.

Charts 5 and 6 have to do with liquid vs dry fertilizer on potatoes. Chart 5 shows that the yields were increased consistently as the nitrogen applications were increased up to 150 pounds of actual nitrogen per acre. Where 100 pounds of nitrogen from ammonia were applied in the conventional manner at planting, the yield was 279 sacks per acre. Where 50 pounds of nitrogen were applied at planting and 50 pounds from anhydrous ammonia in the water 60 days after planting, yields were as good as when the total amount was applied at planting. This tends to indicate that at least part of the nitrogen can be applied efficiently in the irrigation water. It is hardly safe, however, to apply it all in the irrigation water, and some fertilizer must be applied at the time of planting.

The final chart gives further data to illustrate the point. In this test, all of the plants received a total of 100 pounds of nitrogen per acre but applied in different methods and at different times. The highest yields, 468 sacks per acre, were obtained by applying ammonium sulfate at the time of planting; the next highest, 396 sacks per acre, was obtained by applying 50 pounds at planting and

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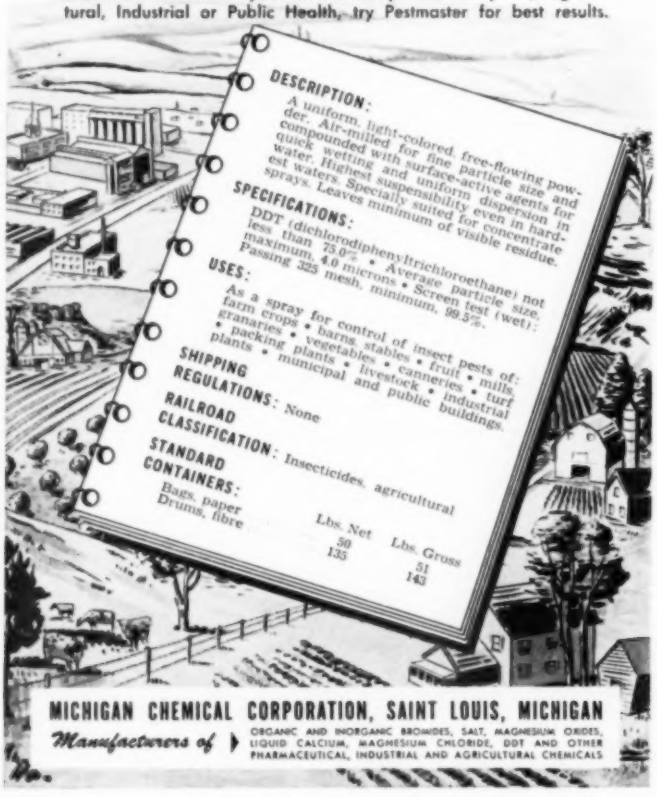
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50 pounds in the irrigation water at the time of plant emergence. Three hundred seventy two sacks per acre were obtained by applying one-third of the nitrogen at planting and two-thirds in the water at emergence. If all of the nitrogen were applied in the water at emergence and none at planting, the yield was 372 sacks per acre from ammonium sulfate and 319 sacks per acre from anhydrous ammonia. This difference between these two sources as liquid applications has been noted in other tests as well as here. Ammonium sulfate has normally given better results than anhydrous ammonia.

Delaying the application until 6 weeks after emergence was a very poor practice. In fact, in this test the yield was even lower than the check. This has also been noted in other tests. In some cases we have associated it with actual burning of the plants by putting too much nitrogen on as anhydrous ammonia but in other tests, no burning has been noted.

INSECTICIDES - FERTILIZERS

(*Continued from Page 38*)

the first year and almost completely ineffective two years after application.

The accumulation of organic insecticides in the soil apparently has certain long range significance. These compounds are currently used in mixture with fertilizer at from 0.5 to 5 pounds per acre. A substantially less amount reaches the soil in this case than the 5 to 20 pounds required annually to control the boll weevil, the 60 pounds per acre for control of the earworm on sweet corn in Florida and the 50 to 80 pounds for some orchard insects. All or nearly all states are now recommending the use of one or more of the organic insecticides at some stage of growth on many vegetables, fruit and field crops. The amount applied annually for almost any dust or spray control program is seldom as little as is apparently necessary for the control of many soil insects.

There is no evidence which indicates a need for unrestricted incorporation of insecticides in fertilizers. An apparent need does exist, however, for an insecticide-fertilizer mixture for the practical control of cetain soil insect pests. The feeling is fairly general among those who have considered the problem that limited authority should be granted for pre-mixing insecticides and fertilizers. This might well take the form of a "customer's mixture" or other limited authority for their addition to standard fertilizers.

Paralleling the procedure of using fertilizer as a medium for applying insecticides, two other approaches to insect control might be merely mentioned at this point. One is seed treatment with organic insecticides where temporary control of certain wireworms has been obtained with from 0.25 to 4.0 ounces per 100 pounds of seed (18). The other is systemic poisoning. Soil applications of octamethyl pyrophosphoramide

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were absorbed by the cotton plant and translocated in quantities highly toxic to the cotton aphid and a spider mite (13).

The potential of insecticide-fertilizer mixtures appears extensive but there are many fundamental questions pertaining to this subject which are only partially answered or entirely unanswered. The matter of soil residues and the influence of the insecticides upon current and subsequent crops are important. We must, therefore, proceed with appropriate caution in recommending the use and permitting the sale of fertilizers containing organic insecticides.

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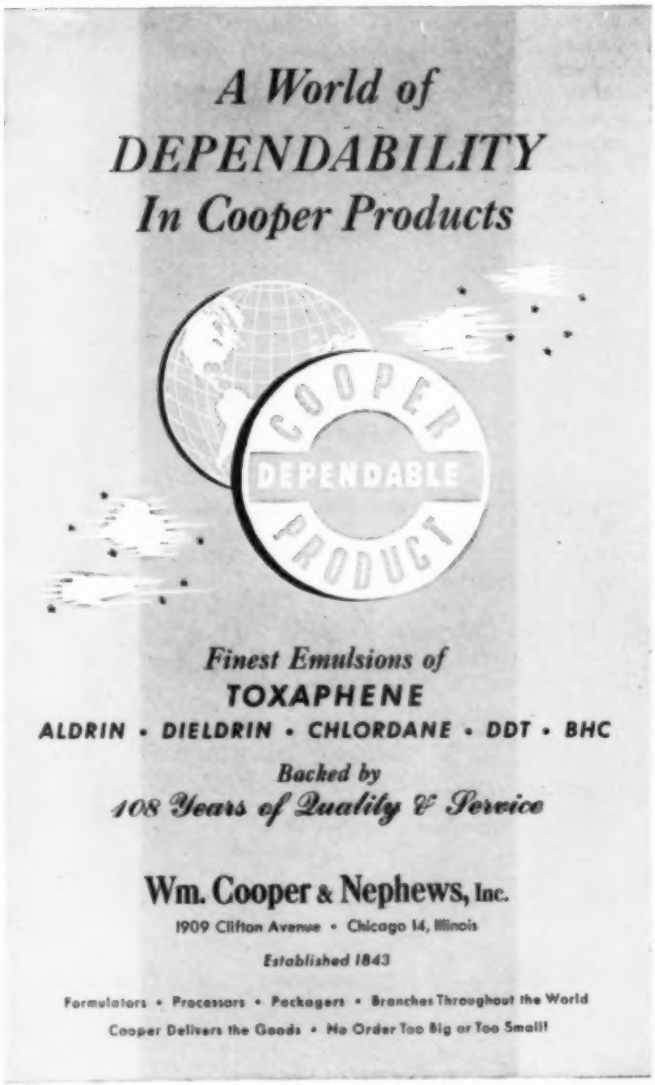
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white fringed beetle. 8 pp. USDA Bur. of Ent. and P. Q., E-750. July 1948.

APPLICATION PLANE

(*Continued from Page 41*)

synthetic rubber liners. These liners will withstand the various chemicals carried and special liners can be used for special materials such as 2,4-D which cannot be cleaned out of a tank satisfactorily. A large oval door, 10 by 16 inches, is provided in each tank for easy access and cleaning and to facilitate filling when it must be done by hand.

Spray booms are located in the space between the wing proper and the flaps, which cover the entire span of the wing. In this position they are out in the open and accessible for maintenance purposes but do not add a significant amount to the drag and power requirements of the plane. It is expected that a wide variety of nozzles will be tested, but the first work was expected to involve the relatively large droplet sizes desirable for application of herbicides and some insecticides. A mechanical drive from the engine will operate either the spray pump or an agitator for the dust hopper at a considerable power saving over the conventional windmill drive. A disc clutch is provided so that the pump or agitator need be operated only when needed.

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ACCORDING to the makers, the plane is capable of operating from small, soft turf strips, and climbs to 50 feet within a distance of a quarter-mile. Desired operating speeds for dusting or spraying ranged from 60 to 90 miles per hour, according to custom operators whose opinions were asked during the planning of the plane. However, for safe flight with acceptable buoyancy while spraying or dusting at 60 mph, the minimum flight speed should not be over 45 mph with full load; or around 37 mph with the plane alone. These minimum speeds are being obtained with a large high-lifting wing and a full-span flap, the makers state. A cruising speed of from 90 to 100 mph for cross-country flight is considered satisfactory by most of the operators who were surveyed. This speed has been obtained, it is indicated.

The makers have considered the problems of the pilot to an unusual extent in planning this special unit. Realizing that the pilot must pay close attention to his flying while close to the ground, controls have been cut to the minimum so that they can be easily located and operated by feet alone. Adjustable seat and rudder pedals are provided to cover the different conditions of operating and cruising, and for pilots short and tall.

Efforts have been made to counteract corrosion from chemicals by use of a vinyl base finish, and furthermore, the plane has been made so it is easy to clean thoroughly, including flushing with a hose.

It is emphasized by Mr. Weick that the plane, the only one of its kind, is entirely experimental, and is still subject to refinements and added

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features to make it more efficient, safe and practical. It is to be regarded as a pattern for specialized aircraft for agricultural use.

GUEST EDITORIAL

(*Continued from Page* 33)

in short supply, but may actually have harmful effects on the crops they mean to protect! Most of these materials, if applied in reasonable amounts, will leave only a small and harmless residue on the product or in the soil. But if too many applications are made, especially if such applications are excessive, there is danger of toxic residues on the products or of harmful building up in the soil.

Other possible harmful effects may be illustrated by what happened in one area in the South last season. Numerous applications of DDT were made to cotton. During this time there was excessive rainfall, and because the insecticide washed off of the cotton plants, more applications had to be made. Water from the cotton fields drained into a river which was well stocked with fish. There was enough DDT in this water from the cotton fields to kill many of the fish in the river. If such occurrences are repeated, or if they become widespread, it can only result in restrictive legislation against the use of DDT and similar insecticides.

As a result of the demand for increased production of certain crops, some farmers will plant crops with which they are unfamiliar. Consequently, there may be considerable crop loss because the farmer may use the wrong materials, or apply them at the wrong time. Such farmers must have special attention from those who are in a position to give advice, so that the proper materials will be used at the right time and in the right quantity, with a consequent saving of insecticide, and an increase in crop yield.

The responsibility of the federal, state, and county agricultural officials is in furnishing advice to growers on the proper materials to use, and the details of correct application. But the greatest responsibility rests on the pesticide men, and especially on the local representatives who make the actual sales to the farmers. This responsibility is twofold:—to see that the farmer gets enough of the proper pesticides; and to see that he is not oversold, so that these materials in short supply are not wasted. In ordinary times the salesman's main effort is to increase his sales. But these are not ordinary times. Now his primary interest must be in the broader objective of obtaining an adequate distribution of his pesticide supply to all farmers, so that the country will be able to meet the emergency need for food and fiber in spite of a short supply of pesticides.★★

SULFUR SITUATION

(*Continued from Page* 51)

represented well under one-half of the world total. United States brimstone, which had increased by more

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than three million tons, now accounted for almost half of the total.

This drastic change in the proportions of the world's sulfur supplied by the various sources of the element was due partly to the disrupting influences of the war. The brimstone mines of Italy and Sicily were shut down in the Allied invasion. Production in Japan was similarly crippled. The extensive pyrites operations of Spain, although not involved directly, were curtailed by the effects of the war and its economic aftermaths. These producers recovered very slowly in the post-war period.

The change was due partly, however, to other factors, principally to the fact that brimstone is better and cheaper! The process by which brimstone is mined from the salt dome deposits yields a product that is better than 99-½ per cent pure—a product that is more economical to ship, and easier to use than sulfur from most of the other sources.

The price of brimstone, moreover, remained very low. At the end of 1950, the price was only about 25 per cent above the average price that prevailed in 1935-39. This compares with a percentage increase in all retail prices of about 78 per cent, and a percentage increase in all wholesale prices of about 118 per cent. Meanwhile, our competitor's costs and prices—that is to say, Spanish pyrites, Sicilian sulfur, Japanese sulfur, etc.—have gone up so much more than ours that the inevitable result has been that demand for American brimstone has increased very substantially.

Big Domestic Demand

WHAT is happening to the large quantities of additional brimstone being produced on the the Gulf Coast? Each of the principal sulfur-consuming industries is operating at higher levels and is taking more sulfur. But the biggest jump in sulfur consumption has been registered by the fertilizer industry. The fertilizer manufacturer, and in turn the farmer, are benefiting most from the additional 3 million or more tons a year of brimstone production.

Back in the 1935-39 period, only about a million and two-thirds short tons of acid were used in making superphosphate, by-product ammonium sulfate and synthetic ammonium sulfate. Last year about five and a half million tons of acid were used for these purposes. This increase put the fertilizer industry far out in front as the number one user of sulfuric acid.

If one seeks to assign credit for this great increase in demand for brimstone, a large part of the credit might be given to the very effective work done by the Department of Agriculture in increasing the use of fertilizer. That is where our greatest increase has occurred.

The demand for sulfur from other users has also increased very greatly, and a good part of this demand comes from sulfur consumers

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1. Apply as a solution with watering can. (Two applications give complete control).
   or
2. Apply with sprayer.
   or
3. Mix with diluent such as sand, vermiculite, etc. and apply dry.
   or
4. Mix with certain fertilizers and apply in Spring to PREVENT CRABGRASS EMERGENCE.

*** Apple Scab Control**

1. In powder form easy to package.
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3. Stable indefinitely.
4. Inexpensive.
5. 1950 field tests proved DPM equal to any mercury formulation.

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2. Use as a solution.
3. Use as a slurry.

*** Agricultural Weed Control**

1. Mix with 2,4-D. Excellent control of weeds and crabgrass in gladiolus and certain other bulb crops.
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in Marshall Plan and other friendly countries abroad. With the demand for sulfur beginning to outstrip the supply by an appreciable amount during the latter part of 1950, exports of brimstone to these countries were curtailed. This created serious supply problems for the nations with whom our nation is allied, and our Government established export quotas to assure that the minimum needs of these countries for sulfur would be met. The quotas for shipments overseas for the first quarter of 1951 amounted to a total of 200,000 long tons, or about 75 per cent of the corresponding average quarterly exports in 1950. Brimstone producers were requested by the Government to see that the quotas were filled and to curtail other sales if necessary.

When the Department of Commerce established these quotas, it, in effect, said, "we will not allow you to ship more than that much." At that point, we said, "well, that is not the problem. We are going to ship to our domestic customers unless you tell us to do otherwise." We were thereupon directed by the National Production Authority, because of international needs and obligations, to ship overseas the specified quotas of sulfur and to cut down on our domestic customers to the extent that is was necessary to do so. We were told that a limitation order would be issued, but prior to the time that could be worked out, we were asked to handle this problem in a practical way and to cut down on our domestic customers to the extent necessary to supply this export quota.

In my company, we established as a base period the year ended September 30, 1950, and notified our customers that we would allocate to them on the basis of 85 per cent of the amount that we shipped them during the base period.

There are two other factors involved in the allocation. In the first place, our production last year was really more than we should prudently count on this year. Last year we produced about 1,243,000 tons, but we cannot safely count on that this year. We had last year what you might call flush production. We have been doing and will continue to do everything that we can to produce just as much sulfur as possible, but ours is not the type of operation where one can be sure exactly what he will be able to produce every month. In order to be safe and prudent, we have made our allocation on the basis of a production figure lower than last year.

Also, in 1950 we reduced our stocks of mined sulfur to some extent. That is the second factor. We sold a little more last year than we produced, although our policy has been not to do so. Back in 1946, we adopted a policy of conserving our production and stocks for domestic customers. We saw our stocks declining and therefore withdrew substantially from the foreign market for a time in order to build up our stocks. We have tried to maintain an even level since then. Under existing circumstances we intend to keep our stocks as they are. Last year we did

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CHLORDANE	DDD
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All concentrates laboratory controlled to guarantee a uniform high quality product. All dust base and wettable concentrates will pass 95% through 325 mesh screen.

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cut into them some, because the procedure for allocation had not been set up, but we do not think it prudent to cut into them any further.

Output High; Demand Higher

PRODUCTION of brimstone thus far in 1951 has equaled the record level of last year, and producers are making every effort to keep the output high. The prospecting and exploration programs that have been actively pressed for so many years are being intensified, two new Gulf Coast mines are being put into production, and a considerable number of other projects are under way. Under the stimulus of insistent demand, higher prices and particularly in view of the fact that our Government has a national policy of providing a depletion allowance so as to encourage exploration, there is a very active program under way at the present time to find and develop new sulfur properties.

In addition to the efforts of the brimstone producers, there have been reports of plans of other companies to bring about production of sulfur from other sources. A few days ago, for example, a large Canadian mining company was reported building a $4 million plant in Ontario to recover the equivalent of about 150 tons of sulfur a day from iron pyrites.

The reserves of sulfur throughout the world are vast. We are not in the unfortunate position of nickel and manganese. Sulfur is an extremely plentiful element. The most important of the other sources in terms of current world production is pyrites. They occur in a number of states and in many parts of the world.

The amount of the reserves of sulfur recoverable from waste gases at smelters and from sour natural gas and petroleum refinery gas are estimated to be of similar magnitude. These estimates, large as they are, represent but small fractions of the estimated reserves of sulfur deposits of gypsum and anhydrite and in coal deposits. They are almost of unlimited magnitude.

The supplies of sulfur in its various forms may be likened to an inverted pyramid. At the tip of the pyramid is brimstone, the best and cheapest source. Next comes pyrites, and then sulfur from the various gases. Finally, higher up the ladder are gypsum and coal. These latter forms of sulfur are more difficult and expensive to produce, and when and how they will be utilized only the future can disclose.★★

INSECT PROBLEMS

(*Continued from Page 47*)

tee in the report that individuals and groups who would be affected by such legislation should be given further opportunity to present their views and to comment on proposed legislation before any specific recommendations are made to the Congress. As the Committee continues its work in the eighty-second Con-

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GENERAL TEXTURE
Mul-si-mo is a thin amber-colored oily liquid about the same viscosity as Kerosene Oil.

METHOD OF USE
There is nothing complicated about the use of *Mul-si-mo*. It is just poured into the oil to be treated at the rate of ½ to 1%, depending upon the tightness of emulsion desired—then thoroughly stirred—and the process is completed.

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A practically 100% Oil Product—No water—No Soap—No Potash nor other Alkalines.

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Mul-si-mo, we believe, is the cheapest and most economical Emulsifier on the market for the emulsification of the oils above specified.

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Extensive tests have shown *Mul-si-mo* to be non-toxic to plants when used at a dilution of 1 to 100. (Plants used in tests—Coleus.) As summer oils are usually used at the dilution of half-gal. to 100 gals. water, at such dilution the rate of *Mul-si-mo* to water would be 1 to 20,000.

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gress, it is hoped that testimony will be given by workers from the Experiment Stations and the U. S. Department of Agriculture as well as others who can contribute. It is possible that unwarranted controls over the formulation and use of pesticides could result in poorer control as well as retarding research and development of new materials.

APPLICATION equipment is, in many instances, just as important as the insecticides and fungicides in terms of ultimate success or failure of pest control. Fortunately we have an extensive program underway, in all parts of the nation, to develop and appraise new applicating equipment. This again is in the larger sense a cooperative program with industry, government and the grower working together. Last spring and summer I had the pleasure of visiting research laboratories in more than thirty states and part of Mexico. While at Texas A & M there was an opportunity to see the new airplane that is being designed and built specifically for agricultural uses. A wide range of interests are participating in this important project and the thought of a plane especially designed for the application of pesticides, among other uses, is most encouraging. This past fall, test flights of the ship took place and I am sure that all of us will watch the developments of the spring and summer as it goes through additional experimentation. This program may well mark an expanding era in the application of pesticides from the air.

At Cornell the Department of Agricultural Engineering has undertaken a research program on application equipment in cooperation with Entomology and Plant Pathology. Certain basic information regarding equipment for the application of concentrates is evolving that is of value in guiding growers now and in the future. A cooperative study is also underway in our stations among the agricultural economists, pomologists, plant pathologists, agricultural engineers and entomologists, to study the cost of pest control on apples. Two years of work have gone into this project, covering over a hundred farm operations with various sorts of sprayers and dusters. The data shows that good growers are able to attain excellent control of pests with all types of equipment now in use, and as would be expected, poor control has been recorded for all types of equipment in the hands of some individuals. Based on cost accounting records, pesticides represented the greatest share of the total cost of control, with machinery second, and labor third.

The development of resistance to insecticides by some insects and mites is a matter of practical concern. Probably the housefly has received the most attention along this line, but it is only one of several species showing definite resistance to some materials. Recommendations are being revised to meet this challenge. Of a similar practical nature is the creation of major pests,

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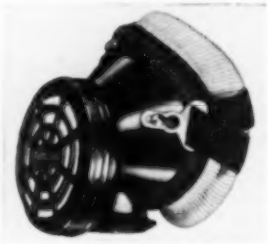

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through the use of insecticides, where minor pests occured before. Take for example, the red-banded leaf roller and various mites on fruit. Prior to the use of DDT for codling moth control we did not have the difficulty with these pests that we have today. Additional applications of specific materials are required for their control which of course add to production costs. As the search continues for new pesticidal chemicals, we find definite lines of thought evolving and experimentation following. Such is the case with the systemic insecticides. These chemicals are absorbed by the plant and kill certain insects and mites that feed on them. As the layman says, 'its a case where the plant bites the bug.' Naturally the canning industry will watch this development closely and with concern. It is only in experimental stages on food crops in this country, but has been used commercially for pest control in some other areas of the world.

In conclusion may I attempt to bring together a few of the thoughts that I have tried to point out during the discussion:

1. Pest control is recognized as an important phase in the production of raw materials for the food processing industry. A variety of insecticides and fungicides are required to do the job and fortunately, we have an array of the most effective pesticides in all of our history.

2. The use of these pesticidal chemicals poses a number of problems, namely (a) effectiveness in pest control, (b) consideration of possible off-flavor reactions and residues on the commodities treated, (c) safe use to the operator, and (d) confinement of toxic materials to areas of treatment.

3. Purity standards of processed commodities are tied-in with effective pest control.

4. New applicating equipment is making possible more effective pest control programs. No matter how good an insecticide may be, it has to be applied properly to be effective.

5. An interpretation of the data furnished the Food and Drug Administration is underway and will form a basis for any residue tolerances that may be set for pesticides used on fresh fruits and vegetables.

6. The Congressional Investigation of the use of chemicals in food products has a direct bearing on the pest control field. The protection of the public health is a basic concept to which each of us subscribes. It is recognized by growers and processors that food production requires pest control to insure quality and quantity of essential raw products.

7. If there is an underlying theme in my remarks, it is a plea for continued and expanded cooperation. Better understanding of each others' problems is essential to progress. As long as the farmer, the scientist, the processor, and the manufacturing industries join hands, the consumers of the nation will be assured of an adequate supply of food products of the highest quality.

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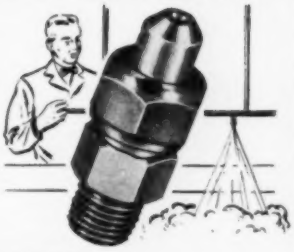

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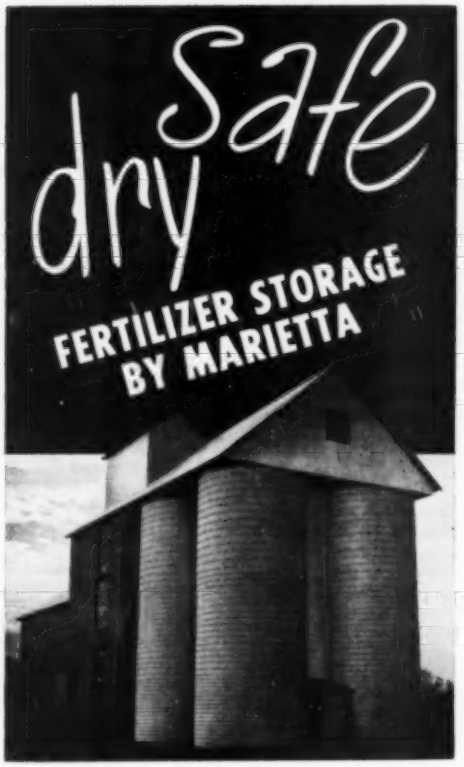

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G. S. McIntosh, TVA, Dies

George S. McIntosh, 59, chief of fertilizer distribution for the Tennessee Valley Authority, died of a heart ailment in Knoxville, Tenn., March 4, after a brief illness. Mr. McIntosh had been with TVA since 1934. During World War II he was loaned to OPA, WPB, and WFA. Prior to joining the TVA staff, Mr. McIntosh had been manager of the Alabama Chemical Company fertilizer plant at Memphis for six years, and before that had been employed by the American Agricultural Chemical Company in Alabama and Georgia for 10 years.

He was a graduate of the College of Agriculture of the University of Tennessee. He is survived by his widow and several brothers and sisters. Interment was at Memphis.

British Fair Scheduled

The British Industries Fair for 1951 will be held at Earls Court and Olympia, London, April 30 to May 11, it has been announced. More than 3,000 manufacturers representing 100 industries are expected to exhibit their products in a million square feet of stand space. The Fair will observe its 36th year in 1951, it is stated.

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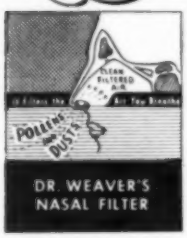

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Positions Wanted:

Sales Staff Specialist Wanted: Purina Mills has an opening for a man 27 to 35 years of age to work as sales staff specialist in Agricultural Chemical Division. Practical background in insecticides and herbicides essential; must have sales personality, rural background helpful but not essential. College degree with major work in Entomology; some Botany and Chemistry useful. Experience in agricultural chemical sales desirable. Work involves helping develop and promote new products and assisting the sales department on special campaigns and programs. Considerable educational work on the use of new products. Also contacts with production, buying, and advertising departments. Considerable platform work in handling fairly large audiences in group selling. Headquarters in St. Louis. Travel about one-third of time. Excellent opportunity with good salary and future. Address A. W. Moise, Purina Mills, Checkerboard Square, St. Louis 2, Missouri, giving age, draft status, and complete details.

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Agricultural Sales or Service: Currently employed chemist, 29, married, no children, draft exempt, desires to work with people rather than things. Personality and appearance suitable to sales work. B. S. in Agricultural Chemistry (University of Toronto). M. S. in Agricultural Biochemistry (Michigan State College). Strong general agriculture background. Teaching experience. Three years chemical research experience with fungicides and insecticides. Familiar with the latest agricultural pesticides. Location immaterial. Address Box No. 520, care of *Agricultural Chemicals.*

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•

Armour Names Riedeburg

Armour & Co., Chicago, have announced the appointment of Theodore Riedeburg Associates, New York, as sales representatives of "Armour Sticker" on the eastern seaboard. The appointment was made by C. A. Lewis, sales manager of the Armour Adhesives division, Chicago.

ALVIN J. COX, Ph.D.
Chemical Engineer and Chemist
(Formerly Director of Science, Government of the Philippine Islands. Retired Chief, Bureau of Chemistry, State of California, Department of Agriculture.)
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Warns on Re-use of Drums

Lest shippers of agricultural chemicals be tempted to re-use drums which have contained 2,4-D or 2,4,5-T, Lea S. Hitchner, executive secretary of the National Agricultural Chemicals Association, Washington, has warned that such reuse is extremely dangerous. "In spite of the serious shortage of containers, drums which contained 2,4-D, or 2,4,5-T should not be used, under any conditions, for any other agricultural chemical" he emphasized. "The residual 2,4-D in the drum could be broken down chemically only by boiling with caustic soda, and the containers would then have to be rinsed and thoroughly cleaned to remove all traces of water-soluble 2,4-D sodium salt. According to the best knowledge available, there is no chemical which will break down 2,4-D or 2,4,5-T into chemical products which would not harm crops."

Mr. Hitchner urgently recommends that all manufacturers shipping 2,4-D or 2,4,5-T formulations put an adequate warning signal on the container to avoid use for other agricultural pesticides.

Expands Arizona Plant

Arizona Fertilizers, Inc., Yuma, Ariz., has completed a $25,000 expansion program on its plant. The biggest part of the investment went into a new insecticide mill which features "prescription" mixing of insecticides for specific jobs. The firm was also planning on a new fertilizer mixing plant to augment its services. This phase of the expansion program was to be completed in March.

•

Pacific AAEE to Seattle

The 35th annual meeting of the Pacific Slope Branch, A.A.E.E., will be held at Hotel Edmond Meany, Seattle, Washington, according to E. H. Littooy, chairman. Dates of the convention are set for June 19-21.

Subjects for discussion include systemic insecticides, radioactive tracers, aircraft application of pesticides and toxicity.

•

Texas Gulf Expands Output

Texas Gulf Sulfur Co., New York, in a letter to stockholders re- to keep pace with the expanding demand for sulfur products. In its plant at Newgulf, Texas, production cently related efforts of the company was carried on at approximately 150% of normally expected capacity, the report said.

A three-year expansion program has seen the company spending $11½ million, including a new plant at Moss Bluff, Texas; and a unit at Worland, Texas for recovery of sulfur from sour gas. Last year the company drilled test holes at Spindletop at Beaumont and has under construction there a new plant which is expected to be in production later this year. Explorations for sulfur are also being conducted in Mexico, but no discovery has yet been made.

•

Named to U. S. I. Board

Election of Seton Porter and John E. Bierwirth as additional members of the board of directors and members of the executive committee of U. S. Industrial Chemicals, Inc., has been announced by Charles S. Munson, chairman, following a recent special meeting of the board of directors. Mr. Porter is chairman of the board of National Distillers Products Corporation, and Mr. Bierwirth is president of the same concern.

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Potash Use Increases

A recent issue of *Potash News Letter*, published by the American Potash Institute, Inc., Washington, D.C., comments on the agricultural outlook for 1951 by stating that most farmers will realize a higher income than in either 1949 or 1950. Production costs will go up too, but not enough to offset all of the gain in receipts, the "News Letter" says.

Regarding the fertilizer situation, the publication states that in contrast with the index of prices paid for all goods and services used in production on farms, the price of fertilizer during the spring and fall of 1950 was slightly lower than for the same periods in 1949. Despite somewhat higher prices for fertilizer in 1951, higher prices for farm products are expected to make it profitable for farmers to increase the use of fertilizers at a more rapid rate than during the past few years. The amounts of nitrogen and phosphoric acid used as fertilizers are now about three times the amount used in the 1935-39 period. The use of potash has increased slightly more—approximately 3.1 times the 1935-39 average. Plant capacity for production of these important plant foods has been increased. For nitrogen it is sufficient to furnish about 15 per cent more than last year. The current capacity for phosphoric acid is 2.8 million tons compared with 2 million tons last year. Domestic potash production capacity is about 1.2 million tons or about 100,000 tons greater than last year. In addition a considerable tonnage of potash from France, Spain, and Western Germany will be available.

•

Hyry to New Position

The appointment of Edmund C. Hyry as manager of their chemicals division, effective March 1st, has been announced by Associated Sales & Supply Company, St. Louis, Missouri, an affiliate of Wood-Treating Chemicals Company. The chemicals division of Associated Sales & Supply Company will formulate and distribute agricultural and industrial chemicals.

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Tale Ends . . .

A BOOK on germ warfare, presenting "six survival secrets" has been issued by the Federal Civil Defense Administration. The booklet, "What You Should Know About Biological Warfare", is a follow-up on the organization's first work, "Survival Under Atomic Attack."

The new book outlines the possibilities of biological warfare attacks, the diffferent types, and suggested public measures to combat them. Referring to the fatal potentialities of germ warfare on an entire city as "a myth", the booklet also states that "talk of poisons that can kill millions is nonsense" and that "no mystery germs" can cause epidemics.

However, the Civil Defense booklet has not minimized the possibility of biological warfare attacks or of their potential threat to human, livestock and plant life. It points to the possibility of germ-laden aerosols, or mists, being loosed by enemy airplanes or by submarines releasing toxic sprays.

Furthermore, enemy agents could be used to pollute foods and water supplies. The possibilities of these agents spreading wheat rusts, foul pests or livestock disease germs are also pointed out.

The booklet lists "Six Survival Secrets for Biological Warfare." These are:

1. **Keep yourself and your home clean. Do not help germs by making things easy for them.**
2. **Report sickness promptly. If you or your family get sick, never fail to tell your doctor. If you live on a farm, report all sicknesses or deaths among your poultry or livestock. Report plant diseases or unusual insects you find in your garden or crops.**
3. **Give all possible help to authorities.**
4. **Never lose your head. Do not rush outside right after a bombing. Unless you have a civil defense job, stay inside until the all-clear signal is given. Cover broken windows to keep out possible contamination.**
5. **Don't take chances with food and water in open containers. Bottled or canned foods would be safe after a biological warfare attack, if the containers were not broken. But foods in the open might be contaminated. If in doubt, boil for ten minutes. That will kill most germs.**
6. **Do not start rumors—do not believe wild stories. Start a rumor and you may start a panic.**

Four Safety Suggestions

The booklet also offers four "keys to Household Safety." These advise keeping the house spic and span; airing bedding, rugs and clothing regularly; keeping the family healthy and closing up the house in case of an attack.

The booklet asserts that "everyone must do what he can to help the health services detect a biological warfare raid at the earliest possible moment when a prompt report might lead to the prevention of many cases of illness and even prevent deaths."

The booklet, as was its predecessor, will be distributed through states and local civil defense organizations. Individual or bulk copies may be obtained from Superintendent of Documents, Government Printing Office, Washington, 25, D. C.

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UNLESS your advertising is seen by the right audience —those who can buy your goods in sizeable proportions—is it not in fact a blank? Handsome illustrations, costly layouts, smart copy, et al, may intrigue readers—but if these readers cannot or do not buy your goods—what value? Advertising primarily is to create demand and sell goods—and must be read by prospective buyers.

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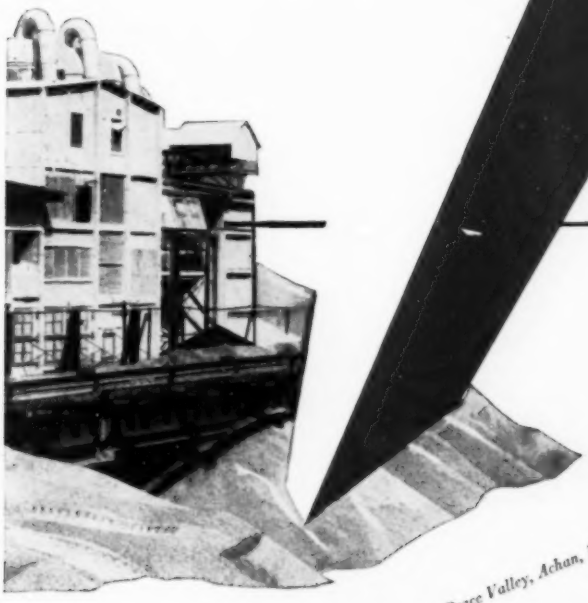

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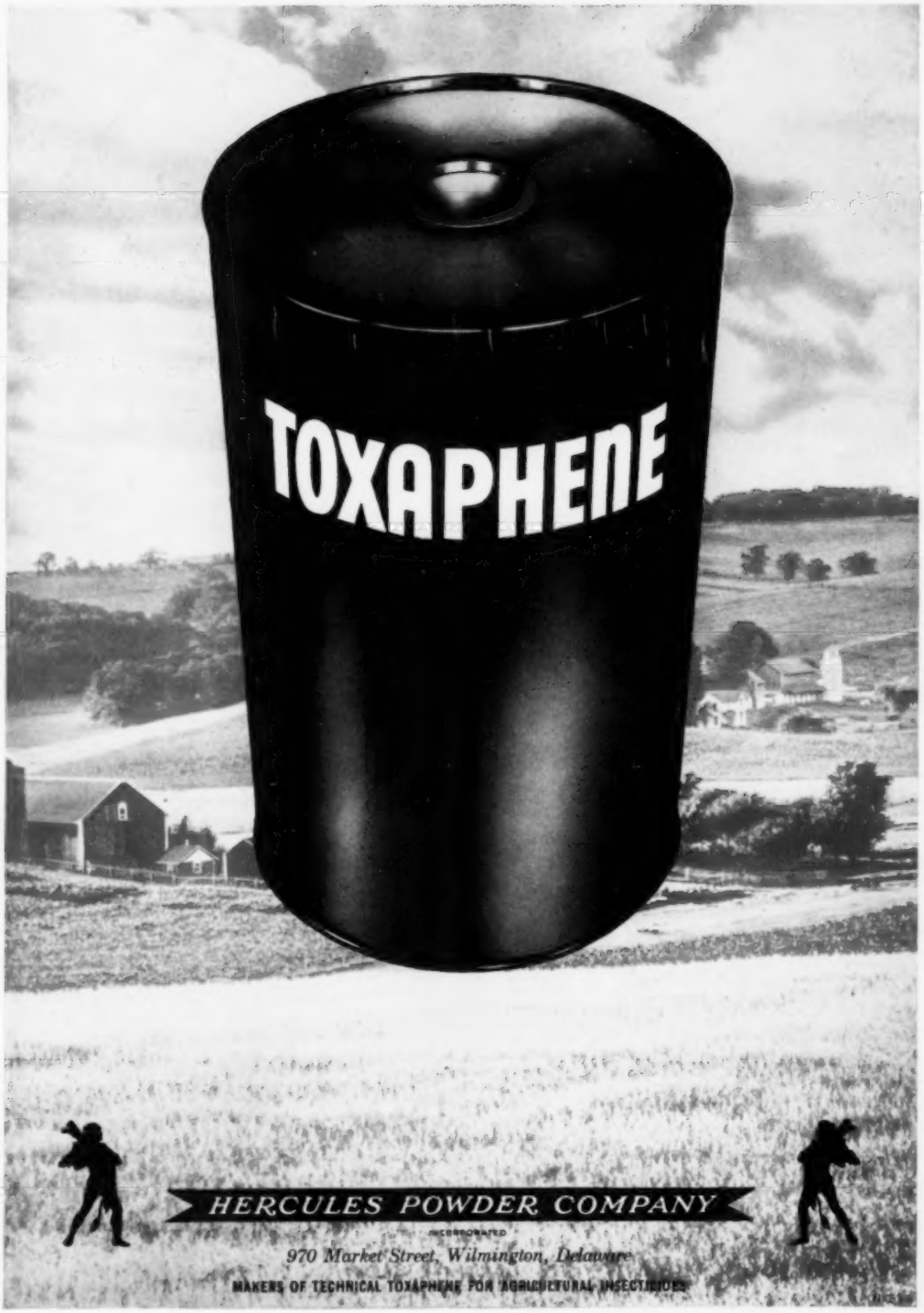
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